THE

physical therapy

REVIEW

Volume 33 - Number 7 July 1953

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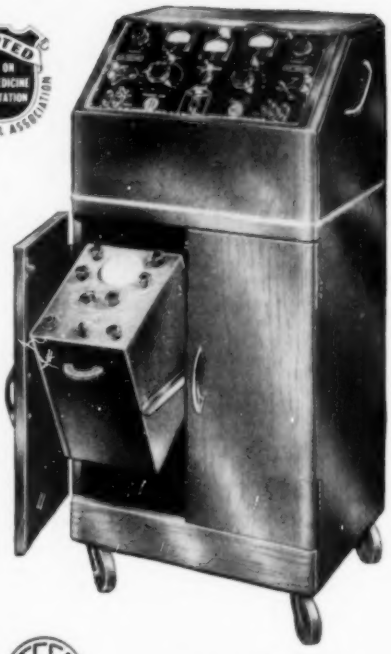

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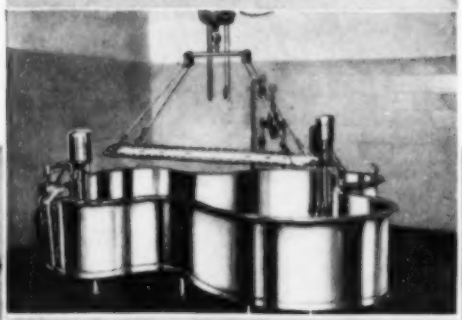

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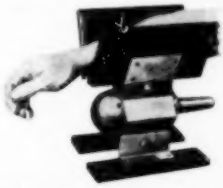

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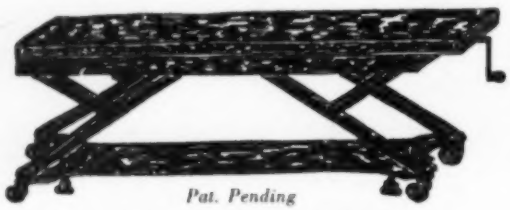

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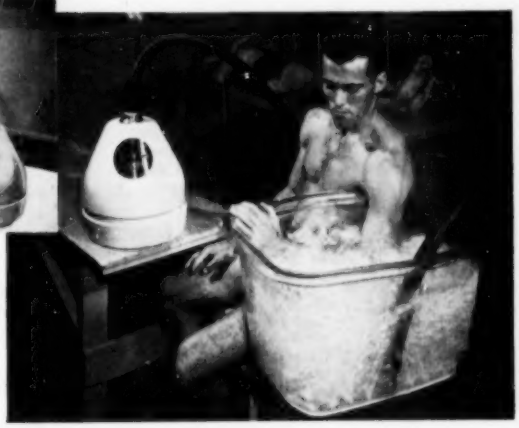

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New York 19, N. Y.

Editor: E. JANE CARLIN

Associate Editors: SARA J. HOUTZ, MARY E. KOLB, BEATRICE WHITCOMB

Managing Editor: CAROL VANCE

Assistant Business Manager: SHIRLEE STERN

Membership in the American Physical Therapy Association is $15.00 a year, including a subscription to THE PHYSICAL THERAPY REVIEW. Subscriptions for nonmembers to THE PHYSICAL THERAPY REVIEW, $6.00 a year; $6.75 in Canada and foreign countries. Single copies 75 cents. (50 cents to members.) Reentered as second class matter August 11, 1949, at the post office at New York, N. Y., under the act of August 24, 1912.

The statements in the manuscripts published in THE PHYSICAL THERAPY REVIEW are made solely on the responsibility of the author. The American Physical Therapy Association does no. assume any responsibility for statements contained therein. Manuscripts accepted for publication in THE PHYSICAL THERAPY REVIEW are for exclusive publication and may not be published elsewhere without permission.

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The Physical Therapy Review

Official Publication of The American Physical Therapy Association

Volume 33 **July 1953** **Number 7**

The Role of the Physical Therapist in the Gamma Globulin Poliomyelitis Prevention Study[*]

Carmella Gonnella, M. S., Georgianna Harmon, M.A. and Miriam Jacobs, B.A.

During the recent controlled studies of Red Cross gamma globulin as a prophylactic agent for poliomyelitis, detailed evaluations of muscle function were made on all patients in the age groups under study. The muscle evaluations were important in determining the presence and extent of paralytic involvement. The summary of information obtained through muscle evaluations by the three physical therapists serving with this research project and some of the problems encountered during the follow-up period of the study are the basis of the present report.

Dr. William McD. Hammon of the University of Pittsburgh, Graduate School of Public Health, organized and directed the poliomyelitis prevention study with the support of the National Foundation for Infantile Paralysis. Gamma globulin was provided by the American National Red Cross. The sites selected for the controlled study were Utah County, Utah, in 1951; Harris County, Texas, in 1952; and two adjoining counties, Woodbury County, Iowa, and Dakota County, Nebraska, later in 1952.

As expressed in the report of the Poliomyelitis Prevention Studies published in the *Journal of the American Medical Association* (October 25, 1952): "The principal purpose of the experiment . . . was to determine whether gamma globulin, as prepared for and furnished by the American National Red Cross for measles prophylaxis, would protect against the paralytic manifestation of poliomyelitis when administered in reasonable dosage before the onset of illness. A secondary purpose was to determine, if protection were afforded, the duration of protection in the dosage selected for the experiment. From this, based on half-life studies of gamma globulin in the childhood age group, the dosage suitable for any period of protection desired could be calculated. Another secondary purpose was to determine whether gamma globulin would permit or interfere with inapparent or milder types of non-paralyzing clinical infection and the subsequent development of active immunity."

Criteria for the selection of the study sites were determined by the director of the project. Since supplies of the inoculum were limited and relatively large numbers of cases were needed for adequate evaluation of the material, measures were taken to select an area which would insure the maximum number of cases in the age group under study. Consequently areas were selected for the study which appeared to be developing severe

[*] The American Physical Therapy Association was asked to assist in the selection and assignment of three physical therapists to serve on the Follow-up Team with this project. The authors of this article were the physical therapists serving in the study areas.

[*] Aided by a grant from the National Foundation for Infantile Paralysis.

epidemics of poliomyelitis. The most susceptible age group in these areas was selected, based on previous experience in the area, as well as on the age distribution of cases occurring earlier during the course of the epidemic under study. The age group in which the largest numbers of cases were expected to occur varied in the different areas. The age groups selected for inoculation were: 2-8 years in Utah, 1-6 years in Texas, and 1-11 years in the Iowa-Nebraska area. This restriction of the age group insured a maximal number of cases in the study group, but at the same time increased the difficulties in accurate muscle evaluation of the patients.

Through a random means of selection approximately 50 per cent of the children injected received gamma globulin and the remainder, an inert substance, gelatin. The latter substance was selected as a control because it was indistinguishable from gamma globulin and was entirely harmless. Neither the parents nor any of the participants in the study knew which type of inoculum was being injected. No information as to the type of inoculum was available to any of the investigators until after the completion of the field studies. A plan was set up to conduct injection clinics for a specified number of consecutive days in the selected areas.

Personnel required to carry out the field studies was selected and detailed plans were made months in advance to expedite the program.* The selection of sites required a prompt decision as to time and place. All participants were expected to move into the areas on a very limited notice. The physical therapists were alerted approximately three months in advance and leave from their permanent duties for the period of the study was arranged. Upon final notification, the three physical therapists reported to the designated areas within three days.

Upon arrival in the selected area, approximately 50 participants from all parts of the country met in conference for final planning prior to the injection week. The participants, including physicians, nurses, physical therapists, public relations chairman, business manager, coordinator of clinics, and chairman of volunteer activities, joined in general group sessions and team units for briefing, reviewing and organizing the project for the particular locale. As a final step before injection week, a "dress rehearsal" was held to familiarize each participant with the clinic procedures and his responsibility to insure smoothness of operation. Local physicians assumed responsibility for the work in the clinics and many volunteers assisted in clinic routines during the injection period.

Clinics held in high schools, health centers, community centers, and churches, were operated morning, afternoon, and evening for the period of approximately one week. These clinic sites were strategically located according to the density of city and county population, transportation, and parking facilities. The clinics were operated on a "first come, first served" basis for the injection of children in the age group designated for the particular area.

At the entrance to the clinic the child and his parents were met by a volunteer worker, who directed them to a reception room where instructions were given on the station to station procedure. At the first station the parents signed a consent form and the child's age and address were recorded. With a little encouragement the youngster moved to a second station for weighing. At the third station the child was placed on a table. As a nurse prepared the part to receive the injection, the physician rechecked the data and selected the quantity of inoculum, calculated on the basis of the child's weight, to be used. The serial number of the inoculum vial was recorded on the child's record and the inoculum injected into the upper outer quadrant of the right gluteus maximus. The children's reactions varied from tears to nonchalance. Each presented the same picture as he walked out of the clinic rubbing the right hip with one hand and clutching a lollipop in the other.

During the week of the injection clinics in the three field test areas, 54,772 children between the ages of 1 and 11 years passed through the clinic doors. At the end of the injection period, except for the follow-up team, all professional personnel returned to their permanent duties or went on to the scene of the next study.

To obtain information regarding the effectiveness of gamma globulin, follow-up teams remained in the areas. The function of each team was to collect data concerning the children within the age group under study who subsequently developed poliomyelitis. An additional function was to gather information concerning the occurrence of poliomyelitis in the remainder of the population as time permitted. The follow-up team consisted of an epidemiologist, at least one clinician, physical therapist, and secretary. Preliminary to the detailed work of this phase of the project, the directors, clinicians, and physical therapists visited the area hospitals which were admitting acute poliomyelitis patients. They met with administrators and hospital personnel to promote understanding of the purposes of the follow-up activities and to plan these activities to avoid conflict with routines of patient care. The cooperation of

medical societies, hospitals, and the general public was excellent and essential in the conduct of the follow-up study. The understanding and cooperation of local physical therapists were invaluable to the physical therapists serving on the follow-up team in carrying forward the responsibility of obtaining and recording data necessary for the success of the study.

From the first day of the injection clinics until the close of the project, all cases of confirmed poliomyelitis and suspicious illness were referred to the follow-up team. The primary responsibility of the physical therapists was the muscle evaluation (or muscle testing) of the children accepted for study by the medical director of the follow-up team. In spite of the apparent simplicity of such an assignment, work was complicated by problems which made it both interesting and challenging.

For uniformity of data, physical therapists were instructed to carry out their initial evaluation approximately five to eight days after onset of illness (after the acute febrile phase) and further muscle evaluations 30 and 60 days after onset. Accuracy in recording birthdates, establishing onset, and collecting data on specified days was extremely important. A daily conference with the follow-up team clinicians provided the physical therapist with the means of obtaining referrals on all new cases and an approximate date for the muscle test. At the time of the initial evaluation, arrangements were made for future appointments to complete the muscle examination series.

Planning a daily schedule so that all muscle examinations would be done at the appropriate time was one of the problems which confronted the physical therapists. In some instances delay in the initial test was unavoidable either because the case was reported late or the child was too ill for a detailed examination at the end of the eight day period.

The location of the case was a factor to be considered in planning a schedule, because patients were seen in hospitals, special outpatient clinics, and in their homes. Maintaining a strict daily schedule was difficult as the study sites covered large areas and travel between the various hospitals and homes was time consuming. Allowances in scheduling also had to be made for the increased time required to examine the younger children in the age group.

As the study progressed, the case load of the physical therapist increased considerably. After the series of 30 day tests were begun, new cases were still being referred to the study for muscle evaluation. Later, daily schedules had to be planned to include not only initial and 30 day tests, but 60 day tests as well, which increased the complexity of scheduling as well as the case load.

Maintaining contact with a large number of patients distributed over large geographic areas made for additional problems of organization. Detailed records were kept on all cases by the secretary of the follow-up team. Health department reports and hospital records were checked periodically for admissions and discharges. Parents were instructed to report address changes. Each physical therapist kept an additional file on all patients. This tickler file provided a device for recording the date of each muscle evaluation and for projecting the date of future evaluations.

The physical therapist's function, as a member of the research team, was to obtain data and to engage in no therapy as contrasted to the usual role of the physical therapist serving in an epidemic area. It was of primary importance to promote understanding of this function of the physical therapist in hospitals, homes, and other places where her duties were performed in order to carry on her work efficiently.

Since the major part of the muscle testing was done in the home or in a special center to which the patient was brought for examination, the physical therapist had contact with many family members. It was extremely important that physical therapists establish rapport with families so that the total series of muscle evaluations could be completed. Other members of the follow-up team depended on this family understanding to facilitate the procedures necessary to the study. Muscle examination findings could not be discussed with parents. Extreme caution had to be exercised in conversation and attitude so that their anxiety about the child's welfare would not be increased. All findings of the team members were interpreted by the medical director of the team to the local attending physician upon request. The physical therapist's only contact with the child was for testing purposes. Time had to be spent in gaining the child's confidence and overcoming his shyness and fear of strangers. Unlike some forms of therapy and other procedures used by the research project, the cooperation of the child was essential before an accurate evaluation of muscle strength could be obtained.

Accurate detailed muscle examinations were of importance in the final evaluation of patients included in the study. In many clinical situations, emphasis is not placed on keen observation and recording of minimal involvement which was necessary in this type of research study. The clinician's examination and the muscle test findings were the basis for classifying cases as paralytic

POLIOMYELITIS FIELD STUDY

Name _____ Onset _____

Birthdate _____ Date of Examination _____

Muscle Examination No. _____ Days after Onset _____

Respiration

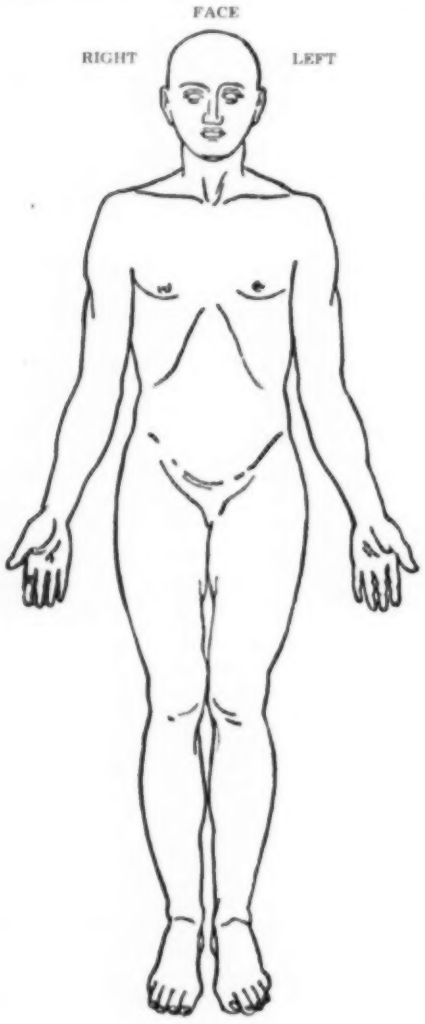
Voice

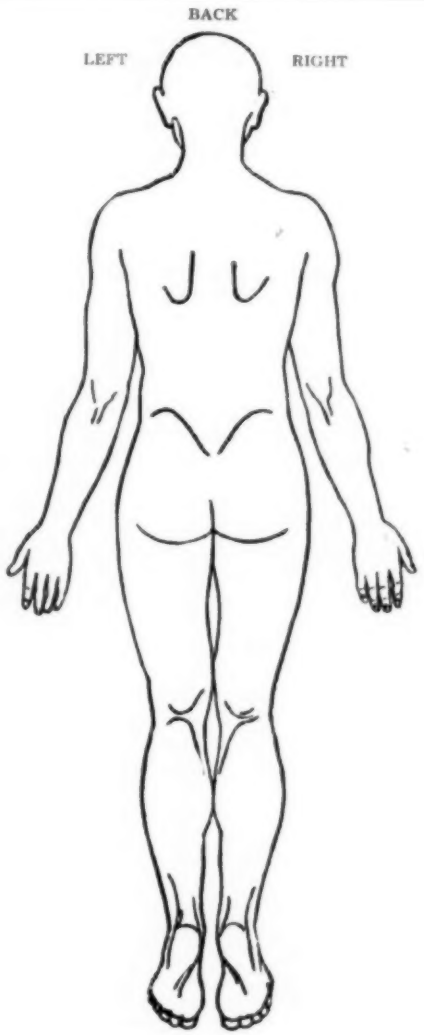
Palate

Deglutition: * Degree 1, Degree 2, Degree 3

Mastication

Tongue





CONDITION OF MUSCLES		
RIGHT	NECK Anterior	LEFT
	Lateral	
	Sternomastoid	
	UPPER EXTREMITIES	
	Trapezius Upper	
	Trapezius Middle	
	Trapezius Lower	
	Serratus Magnus	
	Rhomboids	
	Latissimus Dorsi	
	Pectoralis Major	
	Outward Rotators	
	Deltoideus Ant.	
	Deltoideus Post.	
	Elbow Flexors	
	Triceps	
	Supinators	
	Pronators	
	Wrist Flexors	
	Wrist Extensors	
	Dorsal Interossei	
	Palmar Interossei	
	Flex. Profund. Dig.	
	Flex. Sumblim. Dig.	
	Lumbricales	
	Finger Extensors	
	Opponens Pollicis	
	Thumb Abductors	
	Thumb Flexors	
	Thumb Extensors	

CONDITION OF MUSCLES		
RIGHT	TRUNK Erector Spinae	LEFT
	Iliocostalis	
	Longissimus	
	Spinalis	
	Quadratus Lumborum	
	Anterior Abdominals	
	Lateral Abdominals	
	LOWER EXTREMITIES	
	Outward Rotators	
	Inward Rotators	
	Gluteus Maximus	
	Hip Flexors	
	Tensor Fasciae Latae	
	Gluteus Medius	
	Hip Adductors	
	Quadriceps	
	Inner Hamstrings	
	Outer Hamstring	
	Gastrocnemius	
	Tibialis Anticus	
	Tibialis Posticus	
	Peroneals	
	Extensor Longus Dig.	
	Extensor Proprius Hal.	
	Flexor Longus Dig.	
	Flexor Brevis Dig.	
	Lumbricales	
	Flexor Longus Hal.	
	Flexor Brevis Hal.	

Comments

Examiner:

N or 100% NORMAL	G or 75% GOOD	F or 50% FAIR	P or 25% POOR	T or 10% TRACE	N P. or O NO POWER	I, II, III Spasm according to severity
Function against gravity and resistance	Function against gravity and some normal resistance	Function against gravity only	Function in horizontal plane	A few fibers have active function		

* Degree 1—Accumulation of fluid present; patient able to clear throat and swallow without help.
Degree 2—Excess amount of fluid but area can be cleared by suctioning.
Degree 3—Area fills rapidly; suctioning not sufficient and tracheotomy necessary.

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or nonparalytic. The index of total involvement for each patient, based on the muscle evaluation, was important as a means of determining the effectiveness of gamma globulin and for comparison of the noninjected groups of children and those injected with gamma globulin or gelatin. The necessity for an accurate muscle evaluation in the final analysis of the study is obvious.

One of the basic considerations in planning for participation in the research project was the construction of a muscle examination form which would meet the requirements for the study. (See pages 390-341) The muscle examination form devised by the physical therapists included listing of the basic musculature of the trunk and extremities. In addition, space was provided for evaluation of respiration, deglutition, mastication, palatal involvement and voice quality. The front of the muscle examination form included an anatomical model outline with anterior and posterior views for recording facial involvement, spasm, contractures and deformities, and the lengths and girths of the extremities. Lengths and girths of the extremities, chest measurements, girth of the neck, distance between the adducted scapulae, and measurement of the bulk of the buttocks were taken at the time of each muscle evaluation. Measurements were done with extreme care for detection of atrophy of the affected parts and as an additional aid in the evaluation particularly of the minimally involved patient. A total of 124 muscles or muscle groups was tested and 20 circumference measurements were taken on each patient.

Although recognized as subjective, the use of gravity and manual resistance as criteria for determining muscle strength is generally accepted as the most practical method for testing. Muscle strength was recorded in the conventional manner using the terms (N) Normal, (G) Good, (F) Fair, (P) Poor, (T) Trace, and (O) No Power. For most children under six years of age technics required modification. Because of individual differences found in small children, comparison of one extremity with the other and observation of activities, directed and undirected, were found to be useful procedures in arriving at final evaluation. Questionable cases were checked by more than one therapist to eliminate error in evaluation.

Each muscle examination made by the physical therapist was graded according to the degree of involvement to provide a tentative classification of patients. The examination was then filed with other clinical and epidemiological data pertaining to the individual case under study. Grading provides a means of classification based on the degree of involvement of the weakest muscle.

Criteria used for this classification of patients may be explained as follows:

Grade I	All muscles apparently Normal
Grade IIA	All muscles Good to Normal
Grade IIB	Muscles generally Good to Normal with one or more muscles Fair
Grade III	One or more muscles less than Fair

Grade IIA or IIB indicates minor weakness which might be significant later. Patients classified as Grade IIA might be reclassified as Grade I at the time of the 60 day muscle examination. Patients classified as Grade IIB would usually be reclassified upon resumption of activity. Muscle examination might indicate reclassification as Grade IIA or Grade I if muscle power improves, or as Grade III if the distribution of muscle weakness interferes with normal function or proves to be a potential factor in deformity. Patients who are classified as Grade III are the type most familiar to physical therapists as they usually require muscle reeducation and functional therapy programs.

In one epidemic area, one of us had the unique experience of performing muscle examinations on all confirmed or suspected poliomyelitis patients of all ages occurring in a 12 months period. A summary of the findings in this area is as follows:

Total number of patients on whom muscle examinations were completed	163
Total number of muscle examinations completed	254

Grade:	Number of Patients:
Grade I	50
Grade IIA	25
Grade IIB	47
Grade III	41
*Total	163

A total of 563 patients was referred to the physical therapists in the three areas for muscle examination. Patients with an onset before the first day of the injection clinics in the area had one or two muscle examinations depending upon the date of onset. First examinations and occasionally 30 day examinations were not done on this group of patients as the physical therapists were

* This total does not agree with previously published reports as it represents all patients referred for muscle examination.

not in the area during the early part of the epidemic. All patients in the age group under study, whether injected or not, having an onset after the period of the injection clinics, had three muscle examinations at the approximate intervals of 8, 30, and 60 days after onset of illness. A total of 1,164 individual muscle examinations was completed. Ninety-three of the 563 patients were excluded from the tabulations because they were found to be outside of the geographic area or outside of the age group under study. A classification of 470 children within the age group of 1-11 years referred for muscle examination provides an indication of the degree of involvement found in these children:

	Grade I	Grade IIA	Grade IIB	Grade III	*Total
Iowa-Nebraska	60	61	31	73	225
Texas	35	36	12	68	151
Utah	28	20	30	16	94
* Total	123	117	73	157	470

* This total does not agree with previously published reports as it represents all patients referred for muscle examination.

It should be noted that only one segment of the total number of cases in the areas has been classified above. This is a classification of the age groups: 1-11 years in the Iowa-Nebraska area, 1-6 years in Texas, and 2-8 years in Utah. Of interest is the large number of patients classified as Grade III who will require physical therapy care and supervision.

Final diagnosis was determined by the medical director of the follow-up team and was based on significant history of illness, clinical observations, the muscle evaluation and clinical laboratory reports. Cases were classified as: (NP) Nonparalytic, (S) Spinal, (B) Bulbar, (BS) Bulbospinal and (EBS) Encephalitic bulbospinal. Cases with a final diagnosis of NP (Grade I) were excluded from the comparative studies of the research project and were included in the total study only if positive cerebrospinal fluid findings were present. Upon final review, some of the patients referred for muscle examinations were excluded from the project as not meeting the rigid criteria of the study, although many of these patients were retained in the epidemiological evaluation of the total area.

The field studies were terminated at the end of a five-month period. At this time the 60 day muscle examinations were reviewed and scored by a physician and one of the physical therapists. Scoring was done as a means of classifying each patient by the bulk of effective muscle lost. The physician and physical therapist had no information as to the type of inoculum given to the patients in the study at the time the scoring was done.

The following plan was used to score the muscle examinations. Scoring provided an index describing total involvement for the individual patients for comparison of the gelatin, gamma globulin, and noninjected groups.

1. The function of all muscles or muscle groups was graded 0-5, as compared with the expected normal for the age of the patient. The values representing the loss of function are indicated below:

Functions Against Gravity and Resistance	*Normal*	N N−	0
Functions Against Gravity and Some Resistance	*Good*	G+ G G−	0.5 1.0 1.5
Functions Against Gravity Only	*Fair*	F+ F F−	2.0 2.5 3.0
Functions in the Horizontal Plane	*Poor*	P+ P	3.5 4.0
A Few Fibers Have Active Function	*Trace*	P− T	4.5
No Power	*Zero*	0	5.0

2. Each of the 124 muscles or muscle groups listed on the muscle examination form was also assigned a factor according to its normal bulk or mass. Small muscles were grouped to keep their rating comparable. The tibialis anticus was accepted as a standard for size and assigned a factor of 1.

Sample muscles:	Factor Rating:
Tibialis anticus	1
Gluteus maximus	2
Gastrocnemius	3
Quadriceps	4
Flexor carpi ulnaris Flexor carpi radialis Palmaris longus	1

3. Calculation of total involvement of individual patients was done by using the individual figures (0-5) for independently graded muscles and the mean of individual figures for muscle groups multiplied by the factor rating. For example, the quadriceps with 4 as a factor of bulk

CHART I

PATIENTS GROUPED ACCORDING TO 60 DAY MUSCLE EXAMINATION SCORES

Summary: Utah County, Utah Ages: 2-8 years Dakota County, Nebraska) Ages: 1-11 years
Harris County, Texas Ages: 1-6 years Woodbury County, Iowa)

Muscle Examination Score:	Percent of Involvement:	Number of patients — Onset, Weeks after injection* 1	2	3	4	5	6	7	8	9–14	Total
Inoculum: *GAMMA GLOBULIN*											
0	0	6	..	..	..	..	..	1	..	..	7
1– 19	0.2—3.4%	5	1	2	..	..	3	1	..	2	14
20– 39	3.6– 6.9%	1	..	..	..	..	..	..	1	1	3
40– 99	7.1–17.7%	..	1	1	..	..	..	..	..	..	2
100–199	17.8–35.5%	..	..	..	1	..	..	..	..	1	2
200–399	35.7–71.3%	..	1	..	..	..	..	..	..	..	1
400+	71.4%+	..	..	..	..	..	..	1	..	..	1
Fatal Cases		..	..	..	..	..	..	..	..	1	1
Total		12	3	3	1	0	3	3	1	5	31
Inoculum: *GELATIN*											
0	0	1	4	1	..	1	1	..	..	..	8
1– 19	0.2– 3.4%	11	3	2	2	..	2	2	3	1	26
20– 39	3.6– 6.9%	2	5	2	..	2	1	..	..	4	16
40– 99	7.1–17.7%	2	5	3	1	..	..	2	..	..	13
100–199	17.8–35.5%	..	3	..	..	..	..	2	..	..	5
200–399	35.7–71.3%	..	2	..	..	..	..	..	..	..	2
400+	71.4%+	..	2	..	..	..	..	..	..	..	2
Fatal Cases		..	..	..	1	..	..	..	..	..	1
Total		16	24	8	4	3	4	6	3	5	73
NOT INOCULATED											
0	0	4	2	1	..	1	..	..	1	2	11
1– 19	0.2– 3.4%	8	6	2	6	1	2	2	..	2	29
20– 39	3.6– 6.9%	4	2	1	3	1	1	1	..	1	14
40– 99	7.1–17.7%	3	3	2	2	3	5	..	2	5	25
100–199	17.8–35.5%	2	4	4	2	2	2	1	..	3	20
200–399	35.7–71.3%	2	4	1	5	..	1	1	..	3	17
400+	71.4%+	..	..	..	..	..	..	..	..	1	1
Fatal Cases		..	1	1	..	..	..	1	1	..	4
Total		23	22	12	18	8	11	6	4	17	121

* Indicates the number of weeks after the closing of the injection clinics for the noninoculated group.

and a poor grade (4) of muscle strength would receive a score of 4 × 4 or 16. Whereas a poor tibialis anticus with a factor rating of 1 and a grade of 4 would receive a score of 4 × 1 or 4.

4. Total scores for individual patients could range from 0, indicating no involvement, to 560 for maximal involvement of all muscle groups. Total per cent of involvement could then be calculated. For example: a patient with a total score of 56 would have an index of involvement of 10 per cent.

A summary of information obtained through

muscle examination of patients who were included in the comparative studies of the research project is shown in Chart I. Total numbers of patients, muscle examination scores, type of inoculum if injected, and relationship of injection date to onset date is indicated. Nonparalytic cases were not included in the tabulations. Patients were classified as paralytic if muscle weakness was observed at any time during the 60 day period. Many of these patients, who showed weakness at the time of the initial or 30 day muscle evaluation but had normal power at the end of 60 days, would have been considered as nonparalytic cases in many clinical situations.

It is significant to note that cases occurring during the first seven days after the injection of gamma globulin appear to have minimal if any muscle weakness. During the following period of four weeks fewer cases occurred in the gamma globulin group as compared to other groups. After this period, the protective characteristics of gamma globulin appear to be diminishing. Cases occurring during the first seven days after injection of gamma globulin were modified in severity. This conclusion was based on the 60 day muscle examinations which were made by the physical therapists and accepted by the clinicians as the final report. Lack of modification of the severity of paralysis in cases occurring later in the study had to be established on the same basis. It should be reemphasized that the physical therapists had no information as to the type of inoculum given; therefore, the muscle examinations were completely objective. The greater degree of involvement detected in the noninoculated children was interpreted by the director of the study as supporting evidence that there was poorer reporting of mild cases in the noninoculated groups. The analysis of case incidence has been published in a previous report. It is suggested that the reader refer to detailed and comprehensive reports of Dr. William McD. Hammon and his associates which appeared in the *Journal of the American Medical Association* in the issues of October 25, 1952 and April 11, 1953.

COMMENTS

As participants in a research project, the physical therapists became particularly aware of the importance of the following:

1. Accuracy and promptness in recording and reporting data.
2. Ability to adapt to varying situations in accomplishing objectives.
3. Meticulous observation and skill in evaluating muscle strength in poliomyelitis patients.
4. Appreciation of the muscle examination of the poliomyelitis patient as an important report to the physician for planning treatment and for following progress of the patient.

The large accumulation of data obtained through muscle examination suggests additional analysis or future study:

1. Tabulation of the frequency of involvement of particular muscles or muscle groups.
2. Tabulation of findings of the muscle evaluations performed at 8, 30, and 60 days after onset to indicate the trend of improvement or variants in grades.
3. Muscle evaluations to be done at a future date on the same children to record residual involvement, per cent of improvement, and to investigate the influence of the period of rapid growth.

A Study of Physical Therapy for Poliomyelitis Patients in New York City

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Margaret A. Losty, R.N., and Herbert Rich, B.A.

The most important issues facing administrators of public health programs are how to provide services of high quality, how to make the best use of available personnel, and how to provide the best and most service with the funds available. It is clear that unless programs are continuously reevaluated, there may be perpetuation of some programs which are unnecessary or ineffective, and of other programs which do not make the best use of trained personnel.

An analysis of the follow-up care received by patients who developed poliomyelitis in 1949 in New York City was described in a previous report (*see* Reference). This report indicated that the public health nursing plan in operation at that time was somewhat wasteful of public health nursing personnel. The report indicated the need for strengthening the medical supervision of some of the patients. It also presented some evidence that there was overuse of physical therapy for some patients. The present report will present a further analysis of the provision of physical therapy for these patients.

I Method of Study

During 1949 a total of 2,446 patients with poliomyelitis was reported to the New York City Department of Health, of whom 181 (7.4 per cent) died. Of the remaining 2,265, 137 moved out of the City or were unable to be located within the City. This study, and the earlier one, is composed of an analysis of data on 1,523 of the remaining 2,128 patients. Of this group of 1,523 patients, 907 were originally classified as paralytic, of whom 389 patients (43 per cent) received physical therapy on an ambulatory basis following discharge from a hospital; 32 per cent of the bulbar paralytic group and 47 per cent of the "other" paralytic group received physical therapy following hospital discharge.

Data on the patients were derived from two sources: (1) Public health nursing records describing the findings on visits to the homes of the patients during the two-year follow-up period; (2) Corresponding records of special educational placement of the school-age patients from the Bureau for Handicapped Children. The material obtained by review of these reports gives adequate statistical information for a broad analysis of the length of time physical therapy was administered, and the agencies involved in this care. These sources of information, particularly the individual nursing records, might be potential sources for a more detailed analysis of the type and frequency of therapy given. Correlation of this latter information with the types of agencies giving care with reference to the social, economic, and geographical difficulties encountered in bringing therapy to the patients might be of real value.

II Administration of Physical Therapy

A. Agency Providing Physical Therapy

Of the 389 patients receiving physical therapy, 44 per cent of them received the service through a hospital outpatient department. Forty-seven per cent received it from a nonhospital source, predominantly two community agencies and private physical therapists. Approximately 9 per cent of the patients received physical therapy from both a hospital and a nonhospital source. There were no significant differences between the bulbar and other paralytic groups of patients (Table I). Patients received physical therapy from 24 institutions of which 14 were approved for orthopedic care. Over three-quarters (77 per cent) of the patients who received physical therapy from hospitals received it from six approved hospitals.

From the Bureau for Handicapped Children, New York City Department of Health.

TABLE I

Sources of Physical Therapy

Source of PhysicalTherapy	Bulbar Paralytic	Other Paralytic	Total Paralytic Group
I Hospital	38 (47.5%)	133 (43.0%)	171 (44.0%)
A. Approved	36	128	164
B. Unapproved	2	5	7
II Non-Hospital	36 (45.0%)	148 (47.9%)	184 (47.3%)
Agency 1	20	58	78
Agency 2	8	59	67
Agency 3		2	2
Agency 4		1	1
Agency 1 & 4		1	1
Private physical therapist	7	23	30
" PT & Agency 2		1	1
" physician	1	2	3
Chiropractor		1	1
III Hospital & Non-Hospital	6 (7.5%)	28 (9.1%)	34 (8.7%)
Agency 1 & hospital	2	12	14
" 1, 2 & private PT	1		1
" 1, 4 & hospital	2	1	3
" 2 & hospital	1	8	9
Private PT & Hospital		6	6
Agency 4 & hospital		1	1
Totals	80	309	389

TABLE II

Agency Giving Physical Therapy by Agency Requesting Physical Therapy

Agency Requesting Physical Therapy	Agency Giving Physical Therapy — TOTAL PARALYTIC GROUP						
	Private PT	Private MD	Voluntary Nursing Agency	Hospital OPD	Chiro-practor	Hospital and Non-Hospital	Total
I *Practicing Physician*	29	3	53	10	1	4	100
A. Qualified	28	2	28	8	1	4	71
B. Unqualified	1	1	22	2	–	–	26
C. Type unknown	–	–	3	–	–	–	3
II *Hospital*	1	–	82	155	–	28	266
A. Approved	1	–	79	151	–	25	256
B. Unapproved	–	–	3	4	–	3	10
III *Practicing Physician and Hospital*	–	–	10	4	–	3	17
IV *None*	–	–	1	2	–	–	3
V *Unknown*	–	–	3	–	–	–	3
TOTAL	30	3	149	171	1	35	389

TABLE III

Length of Physical Therapy by Agency Giving and by Status at Three Months After Onset of Illness

Length of Physical Therapy (in months)	Agency Giving Physical Therapy																
	Private PT		Private MD		Nursing Agency			OPD (Qualified)			OPD (Unqual.)		Chiro-practor	Hosp. & Non-Hosp.	Total		
	Par.	No Par.	Par.	No Par.	Par.	No Par.	Unkn.	Par.	No Par.	Unkn.	Par.	No Par.	No Par.	Par.	Par.	No Par.	Unkn.
Under 3	4	3	1		6	10		9	10	1	1	1			21	24	1
3 – 5		1			12	3		16									
6 – 8	4	1	1		20	5		22	1								
9 – 11	3	2		1	30	3		11									
12 – 14	3				24	5	1	14									
15 – 17	3				13	3		9									
18 – 20	2				3			20									
21 – 23	2				4			12									
24 – 26	2				4			12									
27 – 29					2			1									
30 – 32					1			1									
33 – 35																	
36 – 38																	
Unknown								5									
Total	23	7	2	1	119	29	1	132	1								

B. Agency Requesting Physical Therapy

Table II indicates the medical agency requesting physical therapy which also provided the medical supervision to the patients. For the total group, 63 per cent were under the medical supervision of a hospital, 26 per cent under the supervision of a private physician, and 4 per cent under the supervision of both. There is no statistical difference between the bulbar paralytic and other paralytic groups in this respect.

Of the group under private medical supervision, 71 per cent were under the care of a qualified orthopedist, pediatrician, physiatrist or internist; 26 per cent were not under the care of such a qualified specialist. There is no statistical difference between the bulbar paralytic and other paralytic groups in this respect.

Of the group under hospital supervision, 96 per cent were under the care of a hospital which is approved by the Council on Medical Education and Hospitals of the American Medical Association for resident training in orthopedic surgery or physical medicine and rehabilitation. Nine per cent of the bulbar paralytic group were under the care of a nonapproved hospital, in contrast to 2.5 per cent for the other paralytic group. Although 26 hospitals provided medical supervision, 76 per cent of the patients were under the care of six approved hospitals. Of these latter six, four are specialty hospitals devoted predominantly to the care of orthopedic patients.

Regardless of whether or not the patients received physical therapy, the pattern of medical supervision was similar.

By and large in New York City, there is a

cians and half from hospitals. There were no significant differences between the bulbar paralytic and other paralytic groups of patients.

III Duration of Physical Therapy

Of the 389 patients receiving physical therapy, 206 patients (53 per cent) received it for less than 12 months, and 176 patients (45 per cent) received it for 12 months or longer. The longest period of physical therapy occurred in one patient, namely for 36 to 38 months (Table 3).

Of the 389 patients receiving physical therapy, 316 (81 per cent) continued to show paralysis at a period three months after the onset of their illness, and 71 patients (18 per cent) did not show paralysis at that time. Of the latter group of 71 patients, all but 24 or two-thirds of them

TABLE IV

Patients Without Paralysis at Three Months After Onset of Illness Who Received Physical Therapy After Three Months After Onset

Agency Giving	Bulbar Paralytic			Other Paralytic			Total Paralytic		
	Total	No residual paralysis at 3 months, but PT continued beyond 3 mos.		Total # Patients	No residual paralysis at 3 months, but PT continued beyond 3 mos.		Total # Patients	No residual paralysis at 3 months, but PT continued beyond 3 mos.	
		#	%		#	%		#	%
	128	13	10%	164	21	13%			
	5	1	20%	7	1	14%			
	121	10	8%	149	19	13%			
	23	2	9%	30	4	13%			
	2	1	50%	3	1	33%			
	29	–	–	35	–	–			
	1	1	100%	1	1	100%			
	309	28	9%	389	47	12%			

Twelve per cent of the patients, who originally had paralysis, showed no paralysis at three months after the onset of illness and nevertheless received physical therapy beyond that period. The percentages were 24 per cent and 9 per cent in the bulbar and other paralytic groups respectively — a statistically significant difference. There was no statistical difference among the various agencies giving physical therapy (Table 4).

In one hospital, however, 21 per cent of the patients who originally showed paralysis did not have paralysis at three months after onset, and nevertheless they continued to receive physical therapy. This hospital, an approved one, accounted for 11 of the 21 patients in this category.

Further analyses show that there is no statistical difference in use and overuse of physical therapy among the various medical groups requesting physical therapy (the various medical groups responsible for the medical supervision). Just as there was no difference in use and overuse among the agencies giving physical therapy, so, too, there was no difference among the various medical agencies requesting physical therapy.

Nine of the 389 patients received physical therapy after they were discharged by the medical treatment agencies. Of the 9 patients, 4 were bulbar paralytic and 5 were other paralytic. The medical supervision of this group of patients consisted of approved hospitals (5); an orthopedist (1); an approved hospital and a physiatrist (1); two patients had no medical supervision. Physical therapy was given by Agency 1 in 6 patients; Agency 2 in 2 patients; and an approved hospital in 1 patient. The longest lag between medical discharge and discontinuance of physical therapy was eight months in 1 patient. Two other patients received physical therapy for 7 and 11 months, respectively, although they were under no medical supervision. For this group of 9 patients a total of 44 months of physical therapy was lost.

TABLE III

Length of Physical Therapy by Agency Giving and by Status at Three Months After Onset of Illness

Length of Physical Therapy (in months)	Agency Giving Physical Therapy																
	Private PT		Private MD		Nursing Agency			OPD (Qualified)			OPD (Unqual.)		Chiropractor	Hosp. & Neur. Hosp.	Total		
	Par.	No Par.	Par.	No Par.	Par.	No Par.	Unkn.	Par.	No Par.	Unkn.	Par.	No Par.	No Par.	Par.	Par.	No Par.	Unkn.
Under 3	4	3	1		6	10		9	10	1	1	1			21	24	1
3 – 5		1			12	3		16	4					2	30	8	–
6 – 8	4	1	1		20	5		22	11		1	1		1	49	18	–
9 – 11	3	2		1	30	3		11	2					3	47	8	–
12 – 14	3				24	5	1	14	1					2	43	6	1
15 – 17	3				13	3		9	1				1	5	30	5	–
18 – 20	2				3			20	1					7	32	1	–
21 – 23	2				4			12						7	25	–	–
24 – 26	2				4			12						4	22	–	–
27 – 29					2			1	1					2	5	1	–
30 – 32					1			1			1			1	4	–	–
33 – 35															–	–	–
36 – 38														1	1	–	–
Unknown								5			2				7	–	–
Total	23	7	2	1	119	29	1	132	31	1	5	2	1	35	316	71	2

B. Agency Requesting Physical Therapy

Table II indicates the medical agency requesting physical therapy which also provided the medical supervision to the patients. For the total group, 68 per cent were under the medical supervision of a hospital, 26 per cent under the supervision of a private physician, and 4 per cent under the supervision of both. There is no statistical difference between the bulbar paralytic and other paralytic groups in this respect.

Of the group under private medical supervision, 71 per cent were under the care of a qualified orthopedist, pediatrician, physiatrist or internist; 26 per cent were not under the care of such a qualified specialist. There is no statistical difference between the bulbar paralytic and other paralytic groups in this respect.

Of the group under hospital supervision, 96 per cent were under the care of a hospital which is approved by the Council on Medical Education and Hospitals of the American Medical Association for resident training in orthopedic surgery or physical medicine and rehabilitation. Nine per cent of the bulbar paralytic group were under the care of a nonapproved hospital, in contrast to 2.5 per cent for the other paralytic group. Although 26 hospitals provided medical supervision, 76 per cent of the patients were under the care of six approved hospitals. Of these latter six, four are specialty hospitals devoted predominantly to the care of orthopedic patients.

Regardless of whether or not the patients received physical therapy, the pattern of medical supervision was similar.

By and large in New York City, there is a recognizable pattern of usage of certain agencies giving physical therapy by the various medical treatment agencies. For example, private physical therapists are used by private physicians, predominantly orthopedists. Patients receiving physical therapy in hospital outpatient departments are predominantly under the medical supervision of those hospitals. Of the four community voluntary nursing agencies giving physical therapy, two (Agency 1 and 2) administered it to the overwhelming majority of patients. In Agency 1, 77 per cent of the requests came from hospitals and 23 per cent from private physicians. Because of a close affiliation between one municipal hospital and Agency 1, this hospital made 50 per cent of the requests received by Agency 1. In Agency 2 half of the requests were from private physicians and half from hospitals. There were no significant differences between the bulbar paralytic and other paralytic groups of patients.

III Duration of Physical Therapy

Of the 389 patients receiving physical therapy, 206 patients (53 per cent) received it for less than 12 months, and 176 patients (45 per cent) received it for 12 months or longer. The longest period of physical therapy occurred in one patient, namely for 36 to 38 months (Table 3).

Of the 389 patients receiving physical therapy, 316 (81 per cent) continued to show paralysis at a period three months after the onset of their illness, and 71 patients (18 per cent) did not show paralysis at that time. Of the latter group of 71 patients, all but 24 or two-thirds of them

TABLE IV

Patients Without Paralysis at Three Months After Onset of Illness Who Received Physical Therapy After Three Months After Onset

Agency Giving Physical Therapy	Bulbar Paralytic			Other Paralytic			Total Paralytic		
	Total # Patients	No residual paralysis at 3 months, but PT continued beyond 3 mos.		Total # Patients	No residual paralysis at 3 months, but PT continued beyond 3 mos.		Total # Patients	No residual paralysis at 3 months, but PT continued beyond 3 mos.	
		#	%		#	%		#	%
1. *Hospital*									
Approved	36	8	22%	128	13	10%	164	21	13%
Non-approved	2	–	–	5	1	20%	7	1	14%
2. *Voluntary Nursing Agencies*	28	9	32%	121	10	8%	149	19	13%
3. *Private Physical Therapist*	7	2	29%	23	2	9%	30	4	13%
4. *Private MD*	1	–	–	2	1	50%	3	1	33%
5. *Hospital & Non-Hospital*	6	–	–	29	–	–	35	–	–
6. Chiropractor	–	–	–	1	1	100%	1	1	100%
Totals	80	19	24%	309	28	9%	389	47	12%

continued to receive physical therapy for a period beyond three months after the onset of their illness. The longest duration of physical therapy in this latter group was 27 to 29 months (Table 3).

Twelve per cent of the patients, who originally had paralysis, showed no paralysis at three months after the onset of illness and nevertheless received physical therapy beyond that period. The percentages were 24 per cent and 9 per cent in the bulbar and other paralytic groups respectively — a statistically significant difference. There was no statistical difference among the various agencies giving physical therapy (Table 4).

In one hospital, however, 21 per cent of the patients who originally showed paralysis did not have paralysis at three months after onset, and nevertheless they continued to receive physical therapy. This hospital, an approved one, accounted for 11 of the 21 patients in this category.

Further analyses show that there is no statistical difference in use and overuse of physical therapy among the various medical groups requesting physical therapy (the various medical groups responsible for the medical supervision). Just as there was no difference in use and overuse among the agencies giving physical therapy, so, too, there was no difference among the various medical agencies requesting physical therapy.

Nine of the 389 patients received physical therapy after they were discharged by the medical treatment agencies. Of the 9 patients, 4 were bulbar paralytic and 5 were other paralytic. The medical supervision of this group of patients consisted of approved hospitals (5); an orthopedist (1); an approved hospital and a physiatrist (1); two patients had no medical supervision. Physical therapy was given by Agency 1 in 6 patients; Agency 2 in 2 patients; and an approved hospital in 1 patient. The longest lag between medical discharge and discontinuance of physical therapy was eight months in 1 patient. Two other patients received physical therapy for 7 and 11 months, respectively, although they were under no medical supervision. For this group of 9 patients a total of 44 months of physical therapy was lost.

DISCUSSION

The three possible areas of overuse of physical therapy after it is no longer necessary are: (1) After the patient no longer has a paralysis or muscle weakness; (2) After the period when the patient has reached a plateau and physical therapy is no longer considered beneficial; (3) After the physician or hospital has medically discharged the patient. While, for most patients, this overuse of physical therapy does not do any physical harm, it may in some instances represent an unnecessary expense for the family and, more important, a waste of skilled professional personnel time. The type of medical treatment agency requesting the physical therapy and the type of agency giving the physical therapy did not seem to be factors in its overuse, with the exception of one hospital.

The essential problems would appear to be ones of medical supervision and communication. There is as much overuse of physical therapy when both medical supervision and physical therapy are given in the same hospital, as when supervision and therapy are administered by different agencies. This would appear to substantiate the need for more continuous medical evaluation in the hospital outpatient departments, and for better interchange of information between physicians and therapists in such outpatient departments. This same need to strengthen medical supervision and interchange of information exists when physical therapy is given by nonhospital community agencies. It might be desirable for the nonhospital community agencies giving physical therapy to review their policies regarding certain end-points where service should be discontinued.

The question of overuse of certain service is of more than theoretical importance to a public health administrator, as well as to the professional group involved. Not only is there a shortage of qualified physical therapists as a professional group, but also there is a ceiling of community funds available for services, either through voluntary or through tax sources. Furthermore, it is known that approximately 800 children with orthopedic handicaps, who, because of the degree of their handicap, must attend special orthopedic classes in public schools, now do not receive any physical therapy within the schools. These children, in order to receive physical therapy, must interrupt their education. In all probability if physical therapy were provided within the school system for these children, their education would be interrupted less frequently. It might be of a more intensive nature for a shorter period of time, and maximum rehabilitation of the children might be attained much earlier. Perhaps, this study may result in some redistribution of physical therapy service within the community.

It is possible, also, that some children with locomotor handicaps other than those due to poliomyelitis might be in need of more physical therapy service; or it might be that there is the same overuse of physical therapy for these other children as well. The need for study of this group is apparent.

Forty-five per cent of the patients received physical therapy for longer than 12 months. It has been suggested by a medical advisory committee in the City that as a general rule poliomyelitis patients receive a maximum of one year of physical therapy. Although in certain patients more prolonged therapy may be indicated, it is suggested that careful evaluation by the agency of requests for physical therapy beyond one year would greatly reduce this burden. Also by more careful evaluation of patients at the end of three months after onset, the therapy agency may often call to the attention of the medical agency the fact that paralytic conditions have cleared, and thereby greatly reduce the 18 per cent of patients who received therapy beyond the period of total recovery.

The desirability of continuous reevaluation of any program or service, once it is established, is evident, if there is to be the best and most effective use of professional personnel and of funds, and if all patients in a community are to be assisted to the maximum degree in accord with their individual needs.

SUMMARY

1. A study of patients reported to have poliomyelitis in New York City in 1949 revealed that 32 per cent of the bulbar paralytic and 47 per cent of the other paralytic group received physical therapy following hospital discharge.

2. Forty-four per cent of the patients received physical therapy from a hospital outpatient department, 47 per cent from a nonhospital source (mostly two community agencies and private physical therapists), and 9 per cent from a combination of these two sources.

3. Sixty-eight per cent of the patients were under the medical supervision of a hospital. It is gratifying that of this group 96 per cent of the patients were under the supervision of a hospital approved for residency training in orthopedic surgery or physical medicine and rehabili-

tation by the American Medical Association. Twenty-six per cent of the patients were under the medical supervision of practicing physicians, 71 per cent of whom were qualified orthopedists, pediatricians, physiatrists, or internists. Four per cent received their medical supervision from a combination of these two sources.

4. Patterns of usage of certain physical therapy agencies are described.

5. Forty-five per cent of the patients received physical therapy for 12 months or longer.

6. Eighteen per cent of the patients had no paralysis three months after the onset of their illness; two-thirds of this group received physical therapy after that time.

7. Two per cent of the patients received physical therapy after they had been medically discharged from medical treatment and follow-up.

8. The degree of overuse of physical therapy was the same, regardless of the agency responsible for the medical supervision and for the physical therapy.

9. The implications of these findings are discussed.

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Poliomyelitis: Functional Progress Report of Fifty Cases Approximately Five Years Post-Onset

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Every therapist wonders what has happened to former patients. This is not idle curiosity. The desire to hear about what transpires when the patient "goes out into the world" is prompted by professional needs. An estimate of just how much of a handicap certain disabilities are, for instance, is essential to the planning of treatment emphasis and vocational counseling.

Vocations, functional progress and continuance of physical therapy treatments are of particular interest to physical therapists and will be the chief concern of this condensation of material gathered from a private survey conducted among former patients at Army and Navy General Hospital. This facility, located in Hot Springs National Park, Arkansas, was the Army's center for the treatment of poliomyelitis during World War II and for several years afterward, providing a fertile field for research. Krusen and Nitshke based their studies on many of the same persons covered by this survey and their remarks, particularly Nitshke's concerning treatment uniformity, are pertinent background for this article.

Questionnaires are not an ideal method of gathering data because a large part of the sample usually will not return the questionnaire and replies are apt to be unreliable in character. It is believed that these disadvantages tended to cancel each other in this particular survey. Of the 135 former patients who were mailed copies of the questionnaire in May, 1950, only 50 replied. The answers, however, tended to come from those who had been most closely associated with the surveyor. Personal treatment records and other data had been compiled, retained, and were avail-

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able in 46 cases to check answers for accuracy. Dates of onset and degree of disability up to 18 months post-onset or discharge, for example, were checked in 44 cases. Dates of onset disagreed in two cases. (One boy had apparently mistakenly written in his discharge date instead of date of onset, the other disagreement made but a few days difference.) Five surveyees had forgotten about an average 2.2 points of early disability. The reliability of this survey can be inferred from this low incidence of discovered error concerning data about which memories of surveyees would be expected to be somewhat vague.

Disability Ratings

A numerical system of rating disability was desired to provide a means of comparing involvement with locality of onset, achievements, etc. For this purpose *two points were counted for each part severely involved* (i.e.: ". . . useless . . . including those requiring bracing because of weakness.") *One point was allowed for each weak but useful part* (". . . . including those made functional by means of surgery.") A maximum rating of 36 points was possible under this system. The totaled ratings were then translated into percentages on the basis of 36 equalling 100 per cent. These numerical disability ratings appear occasionally in the text as comparisons. Sometimes only the terminal rating is used. When an index of progress is desired, the ratio of initial over final DR (i.e.: 8%/3%) is used.

TABLE I

Time	Average DR	Median DR	Least DR	Most DR
Onset	52.2%	50%	8.3%	100%
18 months	31.4%	26.4%	2.8% (3)	77.7%
1950	27.4%	25%	0%	66.6%

Numerical disability ratings: The maximum potential involvement that can be indicated by these ratings is 100%, which was translated from a maximum of 36 points awarded on the basis of two points allowed for each part severely involved ("useless . . . including those requiring bracing because of weakness") and one point for each weak but useful part (". . .including those made functional by means of surgery.")

Table I, which carries the statistical breakdown on disability ratings, should be referred to in order to interpret these comparative figures. The ratings in this survey, of course, must not be confused with the Veterans Administration ratings because 100 per cent involvement or disability rating in this survey stands for considerably more involvement than that necessary to attain a 100 per cent disabled rating.

A visual means of indicating the degree of handicap (Figure 1) was devised to provide a more meaningful method of comparing involvement with achievement. Obviously the pictorial rating cannot coincide exactly with the numerical rating because back and abdominals could not be differentiated, nor could the throat and neck muscles. As can be seen, severely involved portions of the body (those crossed out on the questionnaire) were inked out. Functional though weak parts (those circled on the questionnaire) were lined. As the cases are listed in order of severity of initial involvement, the visual disability guide also serves in a slight measure as a comparison of improvement.

Age

The 50 cases reported were a select group, as military groups will be. They were all male. Age at onset was a median 23.5 years. The youngest (there were two) were 17, the oldest 35 years of age at onset of the disease.

Onset

An average of 59.08 months had elapsed from the time of onset to the time the surveyee mailed the questionnaire. The least time that had elapsed was 45 months, the most time was 81 months.

No particular epidemic is represented by the group. Onset of 50 per cent was in 1945, 30 per cent in 1946, and 20 per cent in 1944. The Orient provided 60 per cent of the total number of cases studied but these were evenly distributed over the years. As to occurrence by month, 75 per cent reported dates of onset from June to September. Month of onset of 37 per cent of the Orient's total was June (the rainy season). The complete breakdown of occurrence according to locality is as follows:

Orient	
Philippine Islands	26
China	2
Marshall Islands	1
India	1
Total	30
Italy	4
France	3
Florida	3
Virginia	2

Alabama, Arkansas, California, Georgia, Louisiana, New York, North Carolina, Texas—1 each

Severity of the disease appeared higher in the Orient than in the rest of the localities. Seventy per cent of the men reporting terminal disability ratings above the average acquired the disease in the Orient. In addition, all patients with terminal disability ratings of over 50 per cent (six reported this extremely severe involvement) became ill with the disease in the Philippine Islands. The incidences were distributed equally over the years 1944 to 1946.

Treatment

An average of 18.8 months of Army hospitalization was reported, the maximal and terminal portion being at Army and Navy General Hospital. The least Army hospitalization reported was 10 months, by Case 50 who had an 8%/3% disability rating ratio (see Figure 1). The most Army treatment reported was 36 months, by Case 4, with an 89%/44% DRR, who stated at 31 months post-onset that he was continuing to improve in upper extremity strength. Neither of these cases reported additional treatment after leaving the Army.

Treatment after being discharged from the Army was reported by 15 cases. In addition, one reportee (Case 43), excluded from that figure because treatments were not regular, stated that he had whirlpool and massage occasionally for severe cramps in the involved extremity.

The average length of additional treatment was 13.2 months, making a group average of 5.5 months additional treatment and a group sum of 24.3 months total treatment. The least additional treatment reported was for one month (by Case 14) while the most was for 38 months (Case 6, DRR 89%/47%) and continuing at the time of the survey. Case 6 also had the most total treatment, 61 months, though Case 11 was a close runner-up with 60 months.

Eleven cases had received institution-sponsored additional treatment. This total includes four who received treatment at Georgia Warm Springs, three who received Veterans Administration treatment, two who were treated in clinics at universities they were attending, and two who benefited from state sponsored programs.

Non-sponsored treatment was reported by three cases. Case 1 attended a rehabilitation center, Cases 13 and 14 employed private physical therapists. A final reportee (Case 15) did not elaborate on whether his massage and swimming two times a week were adequately supervised and was classified as receiving questionable treatment.

In addition to the above, four cases reported self-administered exercises. All of these cases claimed improvement at the time of answering the questionnaire. This was not substantiated in any way in one case. These cases were not tabulated among those receiving treatment in Table II. Only regular and presumably adequately supervised treatments were counted.

TABLE II

IMPROVEMENT SELF-RATINGS

Improvement	With Treatment	Without Treatment
Yes	7 (2 − ?)*	21 (8 − ?)*
No	0	20 (2 + ?)*
?	0	2 (1 + ?)*

* Question marks preceded by − indicate no evidence of improvement. Question marks preceded by + indicate substantial evidence of improvement despite surveyees' pessimistic ratings.

Improvement Self-Ratings

Improvement, as one of the surveyees pointed out, cannot be gauged by questionnaire because one cannot divorce the subjective element. No attempt was made toward the impossible task of determining neuromuscular improvement. The interest of the surveyor was in functional progress, or, as it can be called, decrease in disability. In an endeavor to weed out sheer optimism and pessimism, the patients' statements about improvement were checked against ratings for wheel chair dependence, aids used, and disability. The results are tabulated in Table II, which should be considered a gauge of optimism rather than of improvement.

It can be seen that only two cases were undergoing treatment without showing some evidence of progress. Both felt they were improving enough in the upper extremities to warrant continuance of treatment. One, Case 6, was receiving outpatient treatment five times weekly from the Veterans Administration and the other, Case 1, was being treated daily at a large private rehabilitation center.

Surgical Procedures

Fourteen of the cases reported a total of 19 operations including six Lowman abdominal fascia transplants, three triple arthrodeses, two Bunnell opponens transplants, two Jones suspensions, three transplants of posterior tibial and peroneus longus or brevis for gastrocnemius, one transplant of a peroneal for anterior tibial, one transplant of the biceps femoris to the patellar tendon, and one hip flexor relaxation.

All appeared well satisfied with their surgery

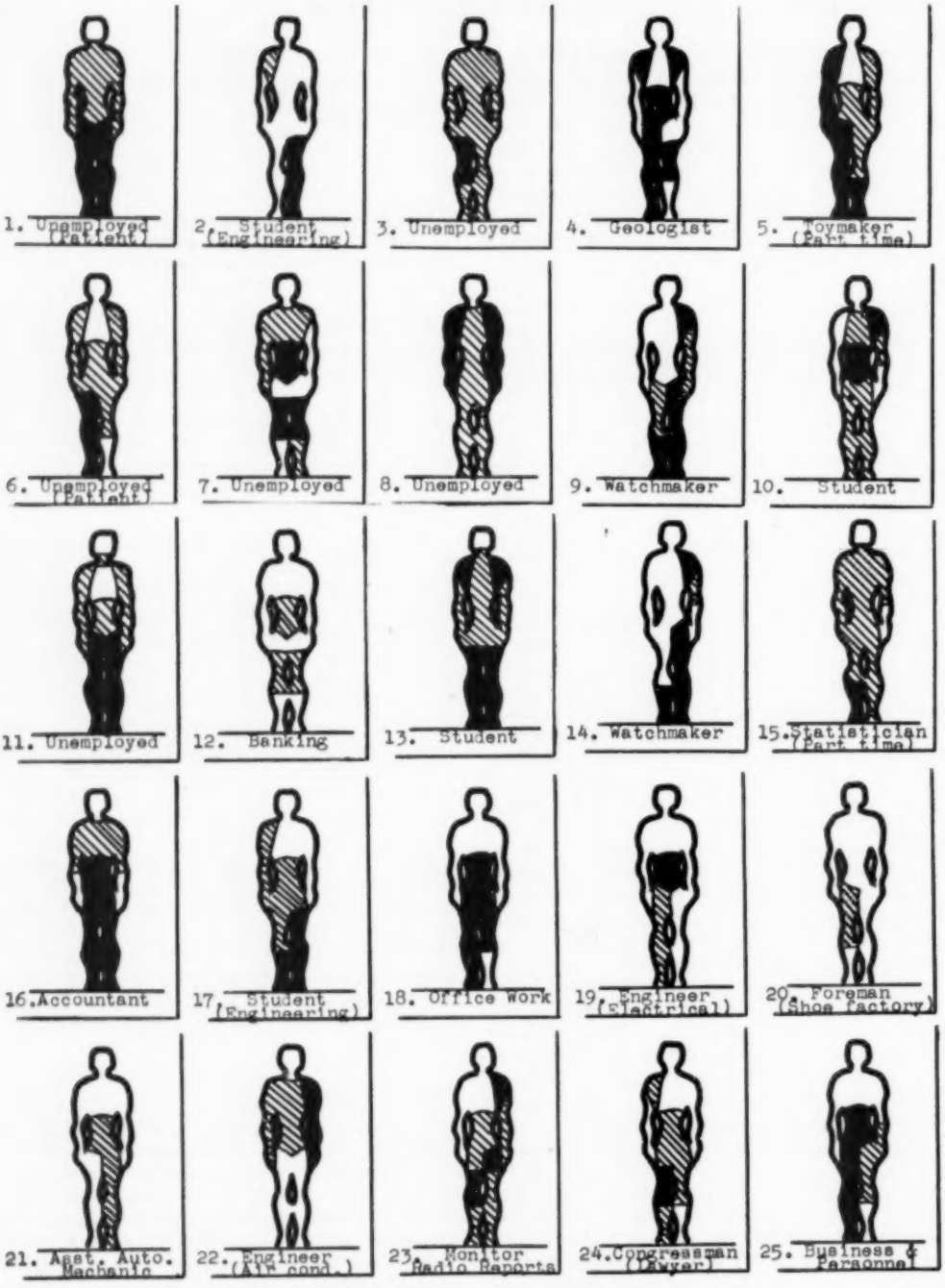
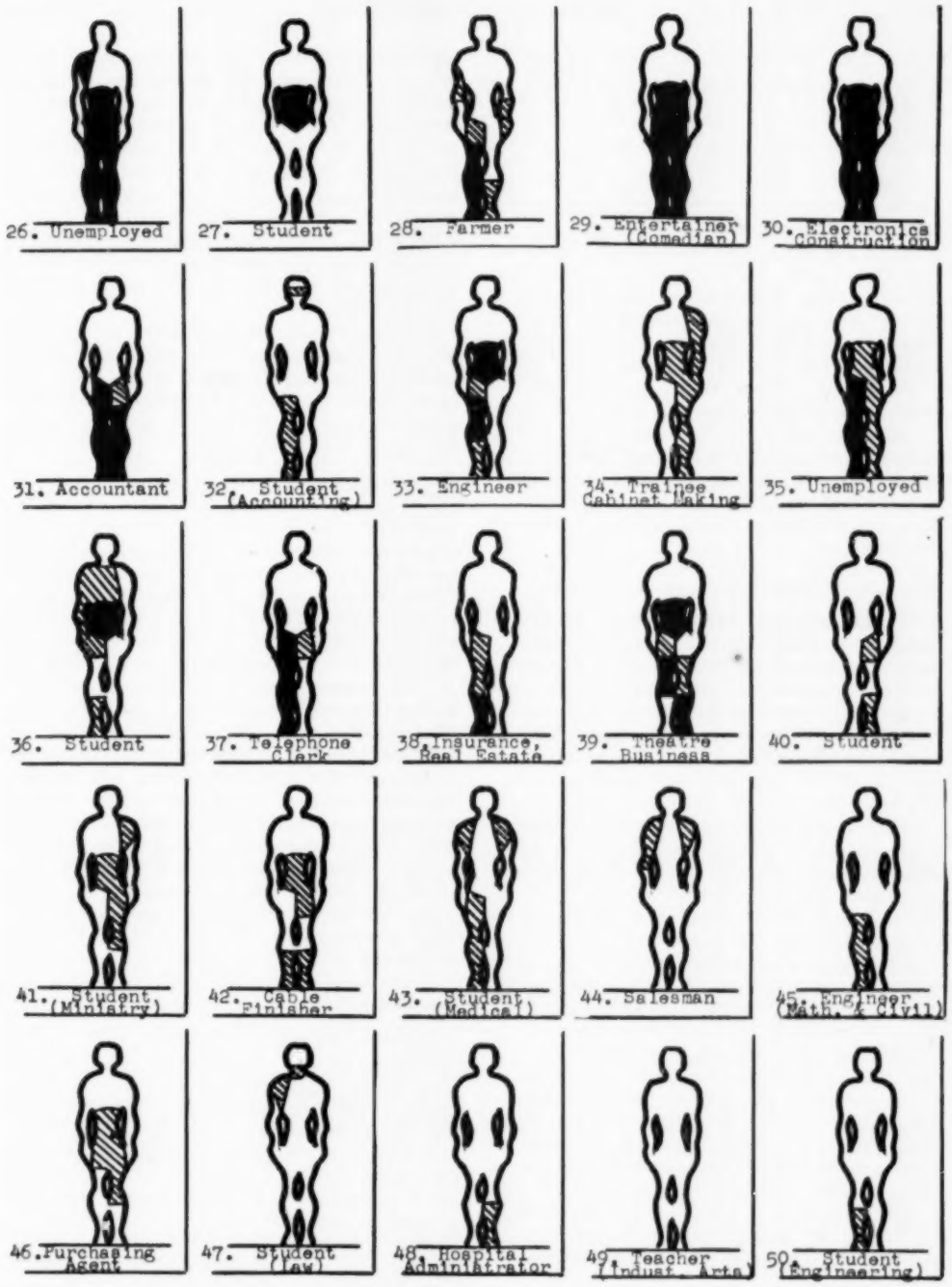


Figure 1. Visual Disability Guide: Cases are listed numerically in order of severity of initial involvement. Black areas are braced or nonfunc-



tional, lined areas are functional though weak. Degree of disability and occupation indicated are as of approximately five years post-onset.

except Case 26 who stated that his abdominal fascial transplant "aided my walking only slightly."

Wheel Chair Dependence

Whereas at 18 months post-onset 44 per cent of the surveyees were using wheel chairs and 28 per cent were totally dependent on them, in 1950 only 32 per cent were using wheel chairs and only 20 per cent were totally dependent on them. Those partially dependent on wheel chairs at 18 months post-onset had averaged 40 per cent use, while in 1950 they averaged 34.9 per cent use of wheel chairs.

Of the ten persons reporting final total dependence on wheel chairs, two of the ten (Cases 26 and 29) had at one time ambulated well by means of braces but had given up walking as too much effort. All but two of these cases (Cases 1 and 13) had been able to walk at least in parallel bars and were using braces at the time of Army discharge.

Functional Progress after Eighteen Months

Median terminal disability reported by the group was exactly half of the initial disability, the major increase in function having occurred before 18 months post-onset. Half of the group accounted for all improvement reported after 18 months since 25 cases did not show any improvement after that time. In fact, five cases (Cases 26, 29, 30, 35, and 39) made no improvement from the time of onset.

Weeding out all but the 25 who continued to improve and compiling averages on this group alone, it was found that 74 per cent of their improvement was made before 18 months. While this is only slightly different from the 84 per cent total for the entire group before 18 months, it becomes significant when coupled with the information that the greatest part of the progress occurring after 18 months was in the trunk and upper extremities. A small percentage of this progress could be all important when related to the difference between physical dependence or independence, employability or nonemployability. Incidentally, surgical procedures played a negligible role in the after 18-months improvement picture, accounting for but three of the 74 units of improvement reported for that period.

It is interesting to note that five cases (Cases 17, 18, 23, 41, and 44) reported more improvement after than before 18 months post-onset.

Physical Independence

Help with daily indoor routine, such as bathing, was reported as still required by Cases 1, 5, 6, 8, and 13. Over 12 months were necessary for 19 patients to regain physical independence. Of this number 14 (Cases 2, 3, 4, 9, 10, 11, 14, 15, 16, 17, 18, 20, 23, and 44) had some initial arm involvement, 11 having severe involvement. Only five of the cases requiring over one year to regain independence had no upper extremity involvement (Cases 29, 35, 37, 39, and 46). It required up to 54 months for some to regain their complete independence, including overcoming transportation difficulties.

Although 79 per cent of the group that required over one year to regain independence or never achieved it had initial upper extremity involvement, 78 per cent of the entire group had initial upper extremity involvement, so this last statistic may be of little significance.

Occupations

Of the five surveyees who never regained physical independence, three were unemployed, one was employed part-time, and one was a student. Altogether only eight cases reported having no occupation. Of these, four were in wheel chairs all of the time, three for a very small part of the time (15 per cent), and one was ambulatory without braces. Terminal disability ratings of this group were considerably above average, or 46.9 per cent.

Those who were employed or were students had much lower disability ratings. The terminal disability ratings of the student group averaged 19.4 per cent as compared to the 25.3 per cent average terminal disability rating of the employed group. Wheel chairs were used by 18 per cent of the employed-student group.

The visual disability guide (Figure 1) provides a comparison of terminal disability wtih occupation.

Vocational Changes

Poliomyelitis did not change the plans of 16 of the surveyees. Six of this group were students, the rest were engineers, lawyer, salesman, farmer, banker, hospital administrator, and real estate and insurance dealer.

A change in vocational plans was reported by 34 cases, including 19 employed, 7 students, and the 8 unemployed. Curiously the reportee with a terminal disability rating of 0 per cent was among those reporting a change in plans, switching from physical education to industrial arts as a teaching field. Other vocational changes were from auto mechanic to office worker, West Point cadet to engineering student, bartender to tele-

phone clerk, trumpet player to statistician, and dentist to entertainer.

It should be mentioned that 43 of the cases studied were eligible for government assistance, particularly educational benefits. In this favorable climate one would anticipate wholesale vocational changes to the white collar and professional ranks, as well as widespread unemployment among the more severely handicapped since disability benefits would make it unnecessary for the most severely involved cases to earn a living. That the latter expectation was not realized can be attributed to the ambition and increasing family responsibilities which characterize the group.

Miscellaneous Effects

In addition to specific muscle weakness, 76 per cent of the men questioned noticed an average of 1.89 various disagreeable and disabling after-effects of poliomyelitis. Possibly owing to the power of suggesion, the three classifications given as samples led the list. Tremor led the listings with half of the patients reporting either arm tremor, which predominated, or tremor of the legs or trunk. Fifteen listed general weakness and 14 listed excessive fatigue. Eight surveyees complained of disabling cramps, particularly in the legs and trunk. One mentioned that he was now very nervous, and one, a former pilot turned accounting student, stated that his eye muscles had been affected and that he has required three changes of glasses, each successively stronger.

One would think patients with respiratory involvement would complain more of general weakness and fatigue. This was not the case; only half of those with initial respiratory involvement listed one of these complaints. It is interesting to note, however, that seven of the eight unemployed listed excessive fatigue or general weakness as chief disabling miscellaneous after-effect. An occupational handicap was arm tremor, which appeared to give the most trouble to students and accountants whose work would be the most directly affected by shaky handwriting. Cramps were another seeming "occupational hazard" as they were listed only by those with unusual occupations such as geologist, shoe factory foreman, cable finisher, etc.

SUMMARY

A survey was conducted among former patients at an Army poliomyelitis center. Fifty persons, replying approximately five years post-onset, reported an average initial involvement of one-half the potential involvement, and an average terminal involvement which was one-fourth of the potential.

The average patient received a little over two years of treatment. Comparatively few patients received treatment following discharge from the army hospital but this additional treatment averaged 13.2 months.

The surveyees as a group were optimistic, over half believing they were still improving although one-third of this group had no positive sign of progress.

Half of the men reported some functional progress after 13 months, substantiated by a drop in wheel chair use after this period. The major part of this late improvement took place in the upper extremities and trunk.

Over one year was required to regain complete physical independence by 43 per cent of the group, 10 per cent of whom had not regained even indoor independence at the time of the survey. The unemployed had a high degree of disability, indicated by an average disability rating of 46.9 per cent, as contrasted with 19.4 per cent for students and 25.3 per cent for the employed group. There were only eight unemployed.

Poliomyelitis had changed the vocational plans of 68 per cent, including the entire unemployed group. The miscellaneous effects of poliomyelitis appeared to have some correlation with vocations in that unemployed persons complained most of fatigue and general weakness while arm tremor was most noticed by the students and accountants.

The following *Comments and Suggestions* are of interest in that they reflect the type of self evaluation made by the surveyees.

Case 2: "Drive to school. Then walk to classes. Had one class on top of Main Hall, 100 steps with a rail . . . One of my new accomplishments is getting off the floor. With lots of practice I can now get up without assistance."

Case 3: "Swimming has helped me most."

Case 4: "Apparent increase in disability of some members is due to non-exercise."

Case 5: "By building ramps, installing an elevator and some other equipment in our home, I have found that I have attained partial independence. In a woodworking shop I find a great deal of enjoyment and some profit. . . ."

Case 6: "I am getting along pretty well and walk pretty well with crutches but have to be helped out of my chair as my arms are still pretty weak . . . Hope my arms will be strong enough to drive in a few months. Then I will go to school." (Author's note: In 1952 he was driving and working, doing clerical work for a wholesale house.)

Case 9 "I had a tough time (in watchmaker's school) due to my left hand, which is still only 50 per cent normal. However, I am now doing okay working for

myself. Can do the work all right outside of being rather slow."

Case 15: "Actually I have solved all transportation difficulties because I have a car of my own . . . hydramatic helps me to drive without the aid of a hand brake or a hand accelerator . . . I can use my left foot on the brake . . . Most everything has been solved except for high steps and they aren't hard if I have someone to hold on . . . the only other difficulty confronting me at present is getting up from certain chairs. Those without arms are real problems when they are setting on slippery floors. This will probably never be solved because of loss of my triceps in both arms. Since I have no triceps I must lock my right arm in front of me between my legs and then push up and back at the same time with my left arm on the back of the chair, or else turn sideways and push straight upwards on the back of the chair."

Case 16: "I've developed a simple gadget for getting to and from the bathtub. It consists of a midget ratchet hoist operated by a hand lever and a collapsible two-piece canvas chair . . . I'll be happy to provide specifications for anyone who could benefit from its use. I'm doing quite well functionally — dress, undress, get in and out of bed and car, drive alone, etc. My remaining obstacle is getting the chair to and from the car. For this I have to rely on the first helpful passer-by. As the reverse side indicates, this all has to be done with a good pair of hands and lower arms plus weak upper arms and shoulders which are still *slowly* strengthening a *little*!"

Case 18: "I don't have any special aids but it is of the greatest importance to have peace of mind and to forget your disability. A car to get around in, a job to work at, and a family to come home to are the only rehab I have had and they have worked wonders."

Case 20: "I attribute my most fortunate recovery . . . to the exceptional care I received (initially) from the PT department . . . After about five days from the onset I was assigned a member of the physical therapy department who spent about four hours a day massaging and going through exercises with me . . . This lasted for about two months, when I was transferred. (To Army and Navy General Hospital from the station hospital). At that time every muscle was responding if only slightly." (This patient had a disability rating ratio of 66.6%/5.5%.)

Case 23: "I have some horizontal bars in our hallway upon which I practice walking with my braces on. I require help . . . in standing and sitting when I do this. My most noticeable improvement since leaving A&NGH has been the strengthening of my left knee and leg so that I now use it constantly to help propel the wheel chair. I do some secretarial work for my church and other typing and I have found that it gives me just the proper amount of exercise to my arms and fingers. My handwriting is now the same as it was before I was stricken. My independence in the home is based on a series of stools and chairs graduated in height and fitted with casters so that I can transfer myself from one to another without standing."

Case 26: "I haven't walked for the last two years. It only gave me a strenuous workout with no improvement and my braces were all disappointing . . . I've lost thirty pounds and get around better."

Case 30: "Many polio victims have available family members to fuss over them and moreover greatly enjoy a dependency relationship. For these, actual independence would be a loss, not a gain."

Case 31: "I do a lot of work outdoors from the wheel chair, that is, landscaping and so forth. Now I plan on buying a power lawn mower with a sulky so that I can mow the lawn . . . I can manage transportation difficulties as long as I drive the specially equipped automobile. Have difficulty getting aboard trains or buses."

Case 31: "After nearly five years from the onset I don't look like I ever had polio except that after attending several classes other students notice that I have a slight limp. I can put in one full day at hard work and have to rest three or four. The best trick I know of for speeding recovery and learning how to use the muscles you have is to get an interest in something that takes you outside the hospital. When away from the facilities of the hospital one improvises to his advantage. My case is not the usual or even bad enough to give any real help . . . but it will fill in the number of cases you need and show that all polios don't wind up in wheel chairs."

Case 33: "He has really made a lot of progress — functional." (Comment by surveyee's wife, a physical therapist.)

Case 34: "When I see that a fall is inevitable, I go limp all over so as to minimize injury to left leg. I've learned to flip myself forward if I see that I'm going to fall straight down."

Case 45: "I don't think he's improving — or has for a long time. Still *needs* brace for much walking." (Comment by surveyee's wife, a physical therapist.)

Case 46: "Am I improving? or merely learning to substitute more and more. Probably both."

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Care of Patients with Respiratory Involvement

Zandra S. Ross

This paper was written to explain to physical therapy students the care of poliomyelitis patients suffering from respiratory involvements. A review of the lectures given by Dr. Clarence Dail of Los Angeles County General Hospital on the fundamentals of respiration is presented. It is hoped this simplification of respiratory physiology and the terms used in discussing it may help to explain a complex situation which many physical therapists in the field must meet. In order to interpret the needs of the respirator patient, normal patterns of breathing should be understood.

Normal Respiration

Internal Respiration

Internal respiration takes place in the body tissues during all metabolic processes. The metabolic rate changes and the need for oxygen varies according to activities and emotional stresses, but it must be supplied if life is to be maintained. Oxygen from the lungs is carried by the red blood corpuscles through the circulatory system to the tissues. There it is exchanged for carbon dioxide which is returned by the blood stream to the lungs.

External Respiration

External respiration occurs when muscle action produces a relatively negative pressure in the chest cavity, making the atmospheric pressure relatively positive, and causing the air to rush into the lungs — inhalation. Exhalation is caused by passive recoil of the inspiratory muscles while at rest. Ventilation of the lungs, a combination of these two, is regulated by chemical mechanisms responsive to metabolic needs of the body, and by nervous mechanisms which modify the basic patterns of breathing to fit the needs of the moment. The respiratory centers in the brain are directly responsive to changes in carbon dioxide, acidity, rate of flow, temperature and oxygen pressure of the arterial blood. The carbon dioxide pressure is by far the most significant factor in regulating ventilation.

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The average minimum requirement of oxygen for the adult is .275 liter per minute. The average amount of air at each breath inhaled or exhaled is called tidal volume. In basal or resting conditions this averages 430 cc. of air at a rate of 16 breaths per minute (*i.e.*, minute volume — 6.9 liters). In a normal person tidal volume is obtained involuntarily by action of the diaphragm.

Inspiratory capacity is the greatest volume a person can inhale with the most extreme effort by use of all inspiratory muscles, starting from the resting level. For a normal person this is about 3 liters. The expiratory reserve volume refers to the greatest volume of air exhaled with the maximum effort, also starting from the resting respiratory level and is about 1 liter. The inspiratory capacity and the expiratory reserve, which are voluntarily controlled, may be needed in determining a patient's endurance and for extra activities. There is still present about 1.5 liters of air —residual volume—which cannot be forced out voluntarily; only a fully atelectatic lung contains no residual air.

Vital Capacity

The vital capacity refers to the sum of the inspiratory capacity and expiratory reserve volume. This is the volume of air completely exhaled after a maximum inhalation or vice versa. It is used as an index of lung volume in pulmonary and cardiac disease, and reveals impairment of muscle strength. It should be remembered that vital capacity determination measures the combined forces of all muscles of respiration; the diaphragm, the muscles which expand and compress the chest, the muscles compressing the abdomen, and the accessory neck muscles. In some instances, the muscles which may be used to pump air into the lungs must be considered (glossopharyngeal or "frog" breathing). Although vital capacity determinations are of great clinical value, muscles responsible for producing the vital capacity are important in this study. Fractional determinations frequently should be considered, *i.e.*, what change in volume is produced by the maximal effort of the individual muscle groups acting alone—particularly the diaphragm.

Determination of vital capacity is an accepted, standardized procedure. Normally, the vital capacity standard ranges from 3000 to 4000 cc. In poliomyelitis patients, this figure may drop to 1500 cc. or even to zero. The vital capacity test is important in evaluating the patient's progress and in determining when he should be placed in the respirator during the acute stage. It aids in judging a patient's tolerance when out of the respirator and is an index of the development of muscle strength during the convalescent stage. In making the test, one should recognize that when patients have marked muscle weakness any appreciable resistance in the apparatus may indicate considerable change in the reading. This may be true to the extent that a person with marked muscle weakness may have enough ventilation to maintain himself for several hours, yet be able to produce only very low ventilation figures.

TIDAL VOLUME

Measurement of the tidal volume is valuable, especially with patients who are confined to the respirator, because of relatively marked weakness of the respiratory muscles. The normal tidal volume for an adult is approximately 400 cc. Values of tidal volume which are appreciably less than this should be considered as an indication of inadequate ventilation and it would be doubtful if a patient with below-average readings would ever be able to sleep without respiratory aid. If a patient in a respirator shows a decrease in the tidal volume where there is sufficient mechanical action of the tank, it may indicate an atelectatic process. When the patient is breathing by his own effort, special care must be taken in making tidal volume measurement in order to obtain reliable readings, since the patient tends to alter the figure greatly by hyperventilation. In evaluating tidal volume the rate also should be recorded. Minute tidal volume is tidal volume times rate per minute.

CARE OF THE RESPIRATOR PATIENT

In considering patients with poliomyelitis, respiratory difficulties will be encountered only in those with spinal, bulbar, bulbospinal or polioencephalitic diagnoses.

1. Symptoms in Respiratory Muscle Inadequacy

Respiratory muscle inadequacy is manifested by wakefulness, restlessness, fatigue, anxiety, and mental confusion. Patients may tend to become taciturn or speak in monosyllables. In advance cases they may become cyanotic. If weakness is the chief cause of the difficulty, the respirations are usually shallow, but regular. There is a decrease in the chest expansion and diaphragmatic action, and there may be movement of the accessory muscles. The patient is likely to be apprehensive. One frequently observes the so-called paradoxical breathing. Normally, both chest and abdomen are raised at the same time. With paradoxical breathing, the chest is raised and the abdomen depressed or vice versa. If there is paralysis of the diaphragm but not of the chest muscles, the rib cage usually rises on inspiration and the abdomen will be depressed. If there is paralysis of the chest muscles alone, the abdomen is raised during inspiration and the chest is depressed. Either muscle spasm or weakness may cause incoordination of respiration, but this usually suggests involvement of the respiratory center.

2. Treatment

Treatment of muscle spasm consists of intensive and prolonged series of hot packs placed over the chest and upper abdomen. If these fail to give adequate relief, the patient may require use of the respirator as well. Embarrassment due to muscle weakness or paralysis definitely indicates its use.

It is at this stage that the vital capacity determination may be of great significance. As a rule, one may state that if the patient's total capacity drops to less than 25 per cent of normal, the patient should be placed in the respirator. If the weakness is chiefly that of the diaphragm, 40 per cent deficiency may require the use of the respirator. Dogmatic dependence on ventilation studies should be guarded against and other symptoms such as air hunger, the use of the accessory muscles, increased pulse rate, etc. should be recognized.

The ventilation studies with the patient in the respirator consist mainly of checking on the tidal ventilation exchange, the desired amount depending on the patient's size and involvement. Usually the tidal air should be between 350-355 cc. The patient's statement that he is short of air should be recognized, even though the respirator settings may be quite high and the ventilation findings adequate. In some instances values as high as 800-900 cc. may be necessary, but serious hyperventilation is likely to be present in such cases and should be guarded against.

3. Precautions in the Operation of the Respirator

Precautions should be taken in the operation of the respirator. Maintenance of proper pressure is paramount, and it should be checked frequently

day and night. A gradual and moderate drop in respirator pressure may cause a serious anoxia of the patient. Pressure gauges always should be checked before and after treatment. Special care should be taken not to snap the wrong switch or to leave open a porthole. It should become a practice to inform the patient before anything is done to the respirator, especially if a porthole is opened. Constant alertness must be maintained that provision is made for operation of the respirator in case of power failure.

4. Rehabilitation of the Respirator Patient

During the acute or febrile period, it is not advisable to remove a patient from the respirator for even short periods of time. Nursing care, packing, and what physical therapy is indicated, should be done through the portholes. The only alternatives would be to remove the patient from the tank on positive pressure.

If there are no debilitating complications when the patient is afebrile, the respirator may be opened a half minute for observation of his unaided respiration. These conclusions together with the vital capacity determination will establish the course to be followed. Before the test is made the patient should be informed of what is to occur, that he will be returned after one half minute and that he will experience no appreciable lack of air. During the test period, his attention should be diverted from his breathing as much as possible.

If no movement of the diaphragm or chest muscles is observed, the test may be repeated and the patient should be encouraged to move either muscle group alone. If no movement at all is detected, the test may be repeated in a few days. If there is only chest action, breathing exercises out of the respirator are contraindicated during the first few weeks to months.

If movement of the diaphragm and chest muscles is present, the test may be continued for several minutes, or until the patient shows signs of fatigue, such as increased pulse, or use of the neck accessory muscles. Exercise periods may be instituted as often as every hour. The respirator should be opened for periods that are about half as long as the time required to cause fatigue even though this may be for no longer than 30 seconds. When the patient is out of the respirator, he should be instructed to breathe as taught by the physician or physical therapist. It is important to encourage diaphragmatic and chest movements even if only a trace can be detected, and to see that the patient uses only these muscles.

During the first few months, the neck accessory muscles may be strengthened, but this should not be done as part of the breathing exercises. These muscles working with a weak diaphragm may distort the breathing pattern. This is important if it is anticipated that the neck accessories will eventually be needed for reserve.

Later, the practice periods may increase in length until frequent treatments become impractical because of accumulated fatigue, or interruption of nursing routines.

After consistent progress on the part of the patient it may be desirable to arrange a schedule such as: "Out two hours twice daily, with an increase of 15 minutes twice weekly."

It should be remembered that fatigue, exhaustion, and even chronic anoxia may be insidious and easily overlooked. The effects tend to be cumulative, manifesting themselves in many ways. Frequently they are confused with primary psychological derangement, changes not due to physical impairment, and even may be the cause of suspected malingering and insubordination. It should be noted that some physiologists specializing in respiration have stated that many unreasonable persons are suffering from chronic anoxia.

Prolonged lack of sleep, physical exhaustion, and anoxia may cause chronic impairment of the body. The symptoms of this include: subjective fatigue, irritability, loss of appetite, anemia, nausea, loss of weight, loss of muscle strength and endurance, drop of vital capacity, disturbance of stomach and bowel function, rapid production of deep sleep when the patient is placed in the respirator, an increased tendency to secondary infections; finally, death may result from damage to the nervous system as well as from lack of somatic nutrition. The loss of morale may depress every function of the body and may even be fatal to some patients.

A patient who is not ready to be weaned from a respirator is taught to use the proper muscles for normal breathing while being adequately ventilated artificially. The diaphragm, responsible for normal basal ventilation, is the logical muscle with which to start. It should be remembered that the muscle cannot work properly without reasonable stability of the chest cage, which is provided when the patient is supine. It is important also that the abdominals and muscles of the back should be exercised at an early stage as they provide stability for the chest and breathing muscles, as soon as the patient is changed from the supine to the sitting position. The degeneration of muscle strength from lack of use combined with lack of oxygen is well known, and the cumulative effect of this on the morale of the patient may be staggering unless planned for early in the program.

The neck muscles, rectus abdominus, and neck and thoracic extensors can be exercised in the respirator by using the head as a lever and should be done in rhythm with the apparatus. Assistance or resistance can be arranged. While the patient is in the respirator, a greater amount of air can be added by increasing the pressure. This affords some active work and increased circulation.

The oblique abdominals and hip hikers can be reeducated with assistive or resistive motion through the porthole and the pressure increased as required.

During this period of his illness the patient should not be removed from the respirator except for the breathing period when he endeavors voluntary action of the diaphragm. Physical therapy and nursing procedures, such as baths, can wait. Although the patient may live through unnecessary removals from the tank, such action causes anoxia and greatly overtaxes the breathing muscles.

OTHER MECHANICAL AIDS FOR RESPIRATION

The Rocking Bed

The rocking bed is another means of providing artificial respiration and may be used if enough air is exchanged. While the bed is rocking it is possible that passive motion and stretching may be administered. It is the author's opinion that the patient should be placed upon the rocking bed not only in the supine but also in the prone position and that some muscle reeducation with proper ventilation be attempted in that position. Clammy perspiration resulting from fatigue, and the use of accessory muscles can be detected quickly. If either occur the patient should be returned to the tank respirator even though he may not have been out the prescribed length of time.

The Hubbard Tank

The use of the Hubbard tank or pool for reeducation may be indicated and is recommended for increasing the range of motion, improving the general circulation, and for the psychological effect on the patient. It is believed that even respiration improves owing to the mild resistance of the water. Here again it should be pointed out that the accessory muscles of respiration should not be used. Intermittent positive pressure would serve as an excellent means of artificial respiration. A rest in the tank respirator following treatment may be essential, just as any normal person may require a rest after heavy work.

OTHER FUNCTIONS OF THE RESPIRATORY MUSCLES

The respiratory muscles are of importance for functions other than breathing. These include: coughing, clearing the throat, sneezing, blowing, sniffing, talking, and singing.

1. *Coughing* is accomplished by closing the larynx and building up intrathoracic pressure to at least 20 mm. Hg., then by its sudden release. Coughing is vital is cases of respiratory infection to keep the trachea and bronchii clear. The ability to cough requires good inspiration to fill the lungs with air, and then adequacy of the laryngeal muscles, chest compression muscles, and abdominals to expell the air. Even in the absence of abdominal strength, if the chest expansion and diaphragm actions are strong, there is enough pressure for a weak cough. Coughing is controlled largely by reflex action initiated by some irritation within the throat, trachea or bronchii. In some hospital wards regular "coughing periods" are arranged.
2. *Clearing the throat* is similar to coughing, but the pressure needed is less. The larynx is partly adducted while there is sustained intrathoracic and intra-abdominal pressure of at least 5 mm. Hg. This process may be necessary for clearing mucus from the larynx.
3. *Hacking* is similar to clearing the throat but more intense.
4. *Sneezing* is associated with extremely high pressures, ranging from 50-250 mm. Hg. It is a reflex which is initiated by irritation of the nose or other stimuli, such as a bright light. It is a definite aid in clearing the air passages. Although a paralyzed patient may produce no appreciable mechanical result when he sneezes he gets relief very much as a normal person does.
5. *Blowing*, which may clear mucus from the nose, employs at least 3-10 mm. of pressure.
6. *Sniffing* draws mucus from the front of the nose to the back, and is also necessary for smelling. In addition to nasal muscles it requires those used for chest expansion, the diaphragm, and the neck accessories.
7. *Speaking*, *singing* and *crying* are accomplished by a controlled air expulsion with coordinated action of the larynx and muscles of the throat, mouth, and face.

Some authorities recommend intermittent positive pressure to stretch the chest and diaphragm. It is used also to help the patient cough and to teach him to use his own muscles.

CONCLUSION

Although this paper has discussed only that period during a patient's illness when he must spend all or part of his time in the respirator, it is felt that proper care during this time may hasten his recovery and rehabilitation. The coordination and close cooperation of physicians, nurses, physical therapists, occupational therapists and the patient are essential to a satisfactory rehabilitation.

A Call Bell Switch for Chest Type Respirator

John M. Gabala, B.S.

Many polio patients who are using the chest type respirator have such limited use of their hands that it is very difficult, and in many cases impossible, for them to use the ordinary light switch to call a nurse. A call bell switch was designed here at St. Anthony's Hospital by Lamar Kishlar, Jr., a respirator patient himself, in conjunction with his father. It is in the form of a bean shaped crescent which enables the patient to signal with his chin from any position. It has been in use here for the past six months and has been a great factor in maintaining the patient's morale. He can call a nurse without disturbing other patients, and he no longer need be fearful of mechanical failure of the respirator, for a nurse can be summoned immediately at his request.

Bell switch being worn by respirator patient.

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One feature of the unit is the use of two micro switches so placed that when the top switch plate is struck a light blow or pushed at any point, one of the switches will function. Although these micro switches measure only ½" x ½" x 2" they are rated ten amperes and can be operated with only a few grams pressure.

Another feature of this chin switch is the use of Alnico permanent magnets to attach the switch to the respirator shell. Formerly adhesive tape was used but the magnets provide more security and flexibility, thereby enabling quicker attachment and detachment.

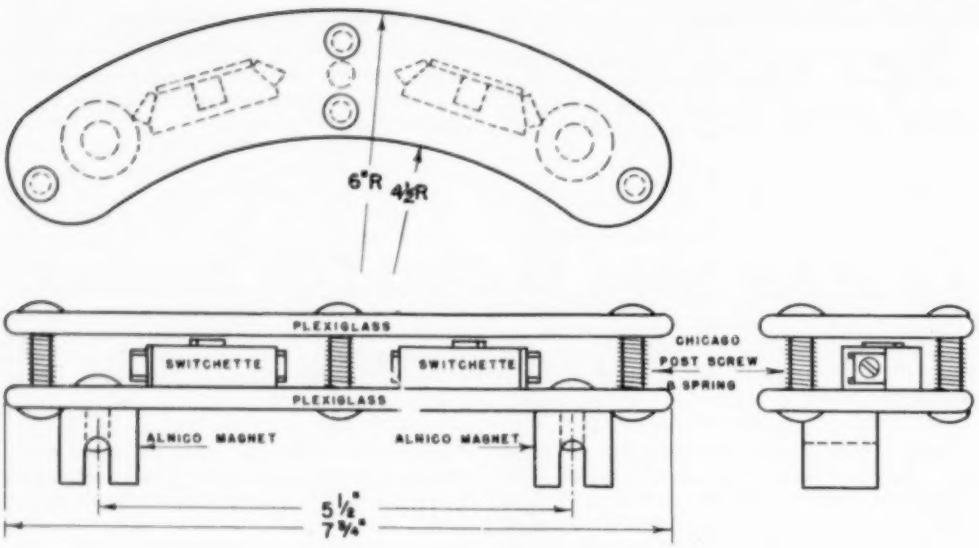
This switch can be built by any good home mechanic with ordinary tools for a cost of about $9.00.

LIST OF COMPONENTS

	Cost
1 Piece Plexiglass 7¾" x 6" x ¼"	$1.00
2 Carboloy Alnico Permanent Magnets, Catalogue #71D1022P4 from Terry Sales Co., Maumee, Ohio	$2.00
2 General Electric Switchettes General Electric Supply Co.	$4.50
4 Chicago Post Screws 1¼" long	.20
2 Chicago Post Screws ¾" long	.10
2 Switch Mounting Brackets	.10
4 Compression Springs	.20
1 Lamp Cord 8' long	.65
1 Miniature Plug and Jack	.35

THE LAYOUT

Two bean shaped plates are sawed from the plexiglass with an outer radius of 6 inches, an inner radius 4½ inches, end radii of ¾ inch, and total width 7¾ inches. This may be done with a jeweler's or scroll saw. The protecting paper should be left on both sides of the plexiglass



during the sawing and filing operations to protect the plastic from scratches. The edges should be filed smooth and rounded and finished with fine sandpaper. If a buffer is available the edges may be polished. Plexiglass is recommended over other plastics because it shatters less and is easily workable with home tools.

Holes for aluminum Chicago Post Screws are drilled as shown. The screw posts may be obtained from most stationery stores as they are commonly used to bind loose leaf books. The holes should be drilled through both plates at the same time and must line up perfectly for best action. Holes for Chicago Post Screws which hold magnets in place are drilled as shown in the lower plate only. The magnet Post Screws must be filed so that the head is T shaped to fit in the slot of the magnet.

The compression springs which fit over the four Chicago Post Screws which hold the plates apart can be secured from most radio supply or hardware stores. The holes in the plates should slide easily over the Chicago Post Screws both top and bottom but should not be large enough to cause side sway. The springs then hold the plates apart with a light spring action.

The switchettes are mounted on the lower plate with small brackets which can be purchased from a radio supply shop or made from light aluminum. The switch brackets may be attached to the plastic lower plate with #2-56 machine screws and nuts.

Keepers for the magnets can be made from any soft iron. They should be 1 to 1¼" in diameter and at least ⅛" in thickness. From an electric shop two 1" knockouts from electric conduit boxes can be obtained and soldered together to make one keeper. The keepers are attached to the chest respirator shell with black scotch electrical tape one layer thick. Too much tape between the magnet and the keeper reduces the magnetic pull which is about 2 pounds for each magnet.

The two micro switches are connected in parallel so that if either switch is closed the signal is operated. The miniature plug and jack is introduced into the lamp cord near the wall on the types of call bell cables which attach permanently to the wall, thus making it possible to disconnect the unit for storage.

It has been found that when magnets are used to attach the call bell switch to the respirator the switch can be detached with ease. There is no sticky tape. When the switch is not in use it may be attached to the iron bed frame or to a piece of sheet iron which is bent and fitted to the frame at the head of the bed.

Magnets can also be attached to the base of the switch of a ceiling book projector and the same principle as stated above can be applied. The buttons with which the patient "turns the pages" with his chin can be built-up with cork, thereby adding to his convenience.

Pool Therapy: Its Effect on Ventilation of Poliomyelitis Patients I. A Preliminary Report

Lucy V. McDaniel, M.E., and Virginia M. Badger, B.A.

The effect of pool therapy on poliomyelitis patients wtih moderate to severe weakness of the muscles of respiration has presented a problem in their treatment programs for many years. The chief objective complaint of these patients has been their inability to get enough "air" during the first few treatments, if they were immersed in water deep enough to cover the chest wall. Because of this, patients were watched closely for signs of respiratory embarrassment when they were sitting or standing in water deep enough to cover the chest. With this clinical problem in mind it was our purpose to attempt to measure the effect that such immersion has on the ventilation, or the total vital capacity. The questions we hope to answer are as follows:

1. Does the vital capacity of patients with differing respiratory involvement change in various positions in and out of pool in comparison with a control group?

2. Does the vital capacity of these patients change in these positions after 30 minutes of pool activity?

3. Does the individual patient's vital capacity change in comparison to a control group and to a patient group?

With that objective data it was thought that selective treatment could be offered to these patients wih a greater amount of safety.

Hamilton and Mayo found that when the body was immersed in water to the nipple line, vital capacity decreased about 300 cc. in comparison to determinations made out of water; however, when diastolic pressure cuffs were put at the base of the arms and legs of the subject in the water the vital capacity was about 175 cc. higher than without the cuffs. To explain the theory presented by them they state that the venous return is increased by immersion sufficiently to increase the blood load in the lungs and therefore to decrease the air space. It also was proposed by these authors that the respiratory effort would have to work against the weight of the water, thereby counterbalancing the compressing effect of the pressure of the water upon the chest wall during expiration. If this is true the mechanical movements are as free under water as they are above.

In this study the influence of posture on the mechanics of respiration and in turn on the vital capacity will be considered. Christie and Beams found in a study of normal persons that the vital capacity was 5½ per cent lower in the lying position than in the sitting position. The reasons for this might be: (1) an increase in the pulmonary blood in the lungs, as mentioned, or (2) the higher position of the diaphragm—both of these conditions due to gravitational factors. These findings were also substantiated and discussed by Hamilton and Morgan, and by Dow who came to the same conclusions.

Because of the timeliness of this problem, Dr. Charles LeRoy Lowman of the Los Angeles Orthopaedic Hospital initiated the study on poliomyelitis patients. He states: "My interest in the respiratory aspect of poliomyelitis patients with trunk involvement dates back to the early thirties when we began to use the fascial transplant operation for the improvement of abdominal paralysis. During this operation, after the fascial bands were attached, the anaesthetists frequently stated that the breathing rate of the patient had changed. Reasoning about this situation I concluded that the restoration of resistance of the abdominal wall

From the Orthopaedic Hospital, Los Angeles, California, under the direction of Charles Leroy Lowman, M.D., Director, Education and Rehabilitation of the Orthopaedic Hospital, Los Angeles, California

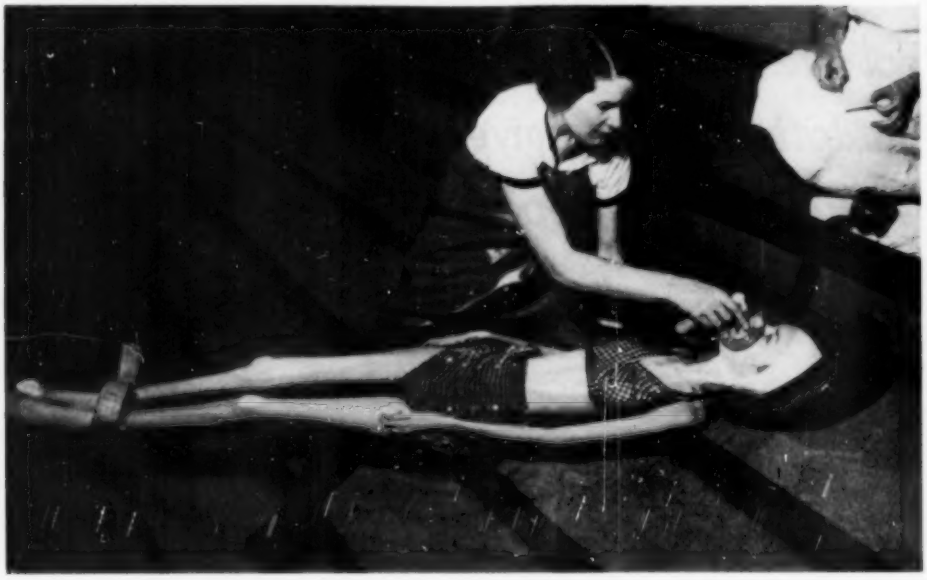


Figure 1. Supine floating with head and ankle supports in place.

to the thrust of the diaphragm helped to increase intra-abdominal pressure sufficiently to hasten more venous blood back to the heart and lungs and thus decrease the need for more rapid breathing and heart action.

"It was found that in most instances the breathing became deeper and slower. Our experience in the pool with patients who had weakened or paralysed abdominal walls, seemed to be improved by pool work and we recognized that the pressure of the water on the abdominal wall acted to give the diaphragm some resistance, or in other words, to become a more effective compression chamber, thus establishing a more effective pump. Over the years the thought had been in my mind that I would like to prove these details more effectively. Consequently some three years ago when Mr. V. Ray Bennett's respirometer came to my notice at the Los Angeles County General Hospital, I at once sought his help and ordered one, and over a year later we received the meter with its specially long tube and mask, which has made possible this study."

I. Material and Methods

The (Bennett) Respiratory Ventilation Meter was used in all tests to measure the vital capacity. It consists of a mask with a flexible tube connecting it with the meter, the dial of which is marked off in 50 cc. gradations. The meter measures inspiration rather than expiration. Its low resistance to gas flow measures accurately respiration of patients with marked breathing difficulty, and is accurate for all age groups. In standardizing the meter, it has been found that the error was less than 5 per cent in all cases, and less than 3 per cent in usual cases. As the air expired did not pass through the meter it did not become contaminated and all other parts were easily sterilized.

The vital capacity was chosen as the method of judging the ventilation because it has proved reliable in other studies as an indication of respiratory function and power. In this situation vital capacity was defined as the maximum amount of air inspired after a forced exhalation. When making the reading, the subject was asked to take a little deeper breath than usual, then force out as much air as possible, and finally to make the maximum inspiration. The best of three readings was used as the vital capacity.

The vital capacity readings in this study were expressed as percentages of the calculated normal since the patients used were of varying ages and of both sexes. This adjustment was necessary as the normal vital capacity is different for men and women. It is much less for children, and as they grow older the increase for boys is much faster than for girls. By reducing all readings to per-

Figure 2. Sitting with the water up to the lower ribs. The hand of the therapist supports the head of the patient for better contact of the mask.

Figure 3. Sitting with the water covering the chest wall.

TABLE I

Position	Normals			Patients		
	Mean	Standard Deviation	Standard Deviation of Mean	Mean	Standard Deviation	Standard Deviation of Mean
1. Lying	89.77	3.62	.88	55.77	2.61	0.67
2. Sitting	96.12	3.22	.78	51.0	4.0	1.11
3. Floating	94.40	2.23	.486	58.0	2.29	0.57
4. Sitting—water to ribs.	95.12	2.69	.576	54.14	3.01	0.778
5. Sitting—water to shoulders	96.10	3.03	.661	54.67	2.82	0.73
6. Floating—after 30 minutes in pool.	95.14	2.75	.60	57.14	2.72	0.726
7. Sitting—water to ribs, after 30 min. in pool.	97.43	2.38	.519	60.57	2.63	0.7
8. Sitting—water to shoulders, after 30 minutes in pool.	96.67	3.13	.684	58.86	2.70	0.721

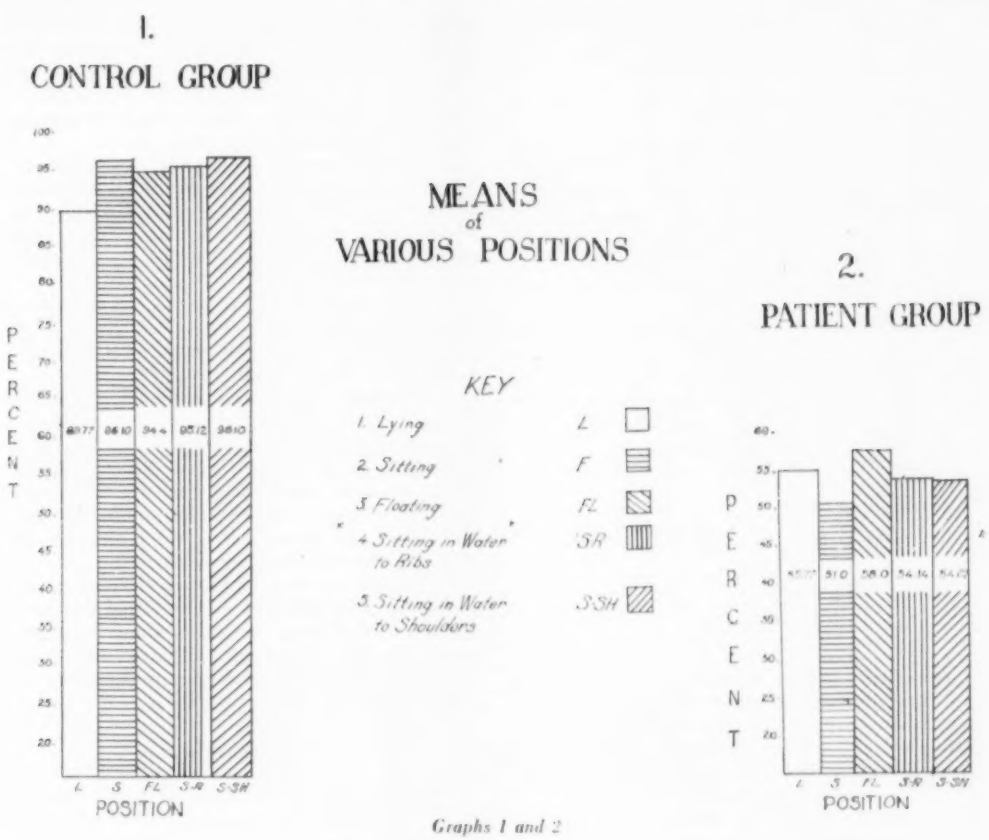
TABLE II

Position	Normals			Patients		
	Mean Difference	Standard Deviation of Difference	*Difference* S. D. of Difference	Mean Difference	Standard Deviation of Difference	*Difference* S. D. of Difference
1. Lying to Sitting	6.35	1.18	5.38	− 4.77	1.30	2.85
2. Lying to Floating	4.63	1.005	4.61	+ 2.23	0.88	2.53
3. Sitting to Sitting-with-water-to-ribs	− 1.00	0.97	1.031	+ 3.14	1.35	2.32
4. Sitting to Sitting-with-water-to-shoulders.	− 0.02	1.02	0.0196	+ 3.67	1.33	2.67
5. Sitting-in-water-to-ribs to Sitting-with-water-to-shoulders.	0.98	0.877	1.12	+ 0.53	0.789	0.67
6. Floating to Sitting-with-water-to-ribs.	0.72	0.76	0.947	− 3.86	0.966	3.996
7. Floating to Floating-after-30 min.-in-pool.	− 0.74	0.772	1.028	− 0.86	0.926	0.93
8. Sitting, water to ribs to same after 30 min. in pool.	− 2.31	0.775	2.98	+ 6.43	1.048	6.12
9. Sitting to Sitting-after 30 min. in pool.	0.57	0.95	0.60	+ 4.19	1.04	4.00

centages comparable figures can be obtained. The calculated normals were obtained from the Age-Height Standard Table determined by Clarence W. Dail, M.D. These were checked by a formula to determine vital capacity according to surface area used by DuBois and DuBois and were found consistent with the above.

Readings were taken in five positions: supine and sitting, out of the pool; supine floating, Figure 1, sitting with water up to the lower ribs (covering the abdominal wall), Figure 2; and sitting with the water over the shoulders (covering the chest wall), Figure 3.

Readings in the pool were taken immediately after the patient was placed in the water which remained at 96 degrees Fahrenheit. Related determinations were then repeated after 30 minutes of pool activity.



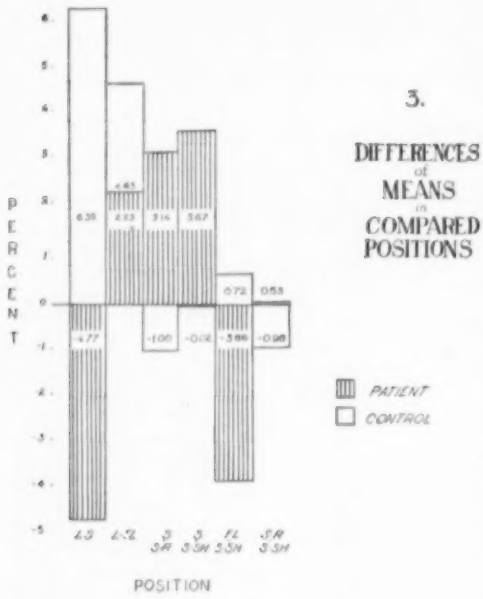
Graphs 1 and 2

Two groups were checked; first, a group of fifteen poliomyelitis patients, who had respiratory weakness ranging from weak abdominals to weak intercostals and diaphragm, to weakness of all muscles of respiration including accessory neck muscles, and secondly, a group of twenty-one persons with normal musculature comprising a control group.

The mean was used to show the central tendency of each group, and the standard deviation was used to show the variability. The standard deviation of the mean was used to check the reliability of the means, and the standard deviation of the difference, to check the reliability of the differences between compared groups. These figures can be found in Tables I and II. If in Table II the standard deviation of the difference (columns 3 and 6) was greater than 2 we considered this difference significant. If it was less we considered it insignificant.

II. RESULTS

In comparing the difference of vital capacity of normal persons in various positions our sampling substantiates the literature which states that the vital capacity is greater sitting than lying (Graphs 1 and 3). In our control group the mean for lying was 90 per cent of the calculated normal with a standard deviation of 3.62; and the mean of the sitting position was 96 per cent, with a standard deviation of 3.22. This difference of 6 per cent checked by the standard deviation of the difference indicates that 98 out of 100 people will have a higher vital capacity sitting than lying. One other control group position combination is statistically significant. There was 4½ per cent increase in the floating position over the lying position. The other pool positions averaged slightly lower than sitting but did not prove significant.



Graph 3

The patient group (Graphs 2 and 3), however, was quite different in many respects. There was a reliable decrease of 5 per cent from lying to sitting out of the water which was just the reverse of the control group. The mean of the vital capacity of the patient group increased, as did the control group, from lying to floating, but only by 2 per cent (as compared to 4½ per cent). The group increased significantly, 3 per cent and 3½ per cent from sitting to sitting-with-water-over-the-abdomen and over the chest, respectively (Graph 3). It decreased 4 per cent from floating to sitting-with-water-over-the-abdomen to sitting-with-water-over-the-chest.

In comparing the changes in percentage vital capacity in the three positions before and after thirty minutes of exercise in the pool (Graphs 4 and 5) we find no important change in the control group. In the patient group (Graph 6) there was an insignificant drop in the floating position, but a noteworthy increase in the two sitting positions. Sitting-with-water-over-the-abdomen increased 6 per cent, and sitting-with-water-over-the-chest increased 4 per cent after exercise.

Next, a study made of the individual differences (Graph 7) in the percentage of calculated normal of the vital capacity gave the following results:

1. Patient number one, severely involved, whose weak diaphragm was his chief source of respiratory power and whose vital capacity was only 24 per cent of his calculated normal, decreased 8 per cent when the water covered his chest wall, whereas the mean for the patient group showed no significant change.

2. Patient number two, whose most effective muscles of respiration were his intercostals and his accessory neck muscles, had only 31 per cent of his calculated normal vital capacity and this showed a drop of 9 per cent in the pool when the water covered his chest.

3. Patient number three, with good muscles of respiration except for a severe diaphragm weakness, also showed a 16 per cent decrease in vital capacity in this position.

4. Patients with weakness of the abdominal muscles (number 4 and number 5) consistently showed a decrease in vital capacity from lying to sitting out of the water. In the water, however, there was a decrease in vital capacity in the position of sitting-with-the-water-over-the-abdomen and then an increase again in the position of sitting-with-the-water-over-the-chest.

5. Patient number six with moderately severe abdominal weakness, but with no significant intercostal or diaphragm weakness, showed a curve much like that of the normal except that it decreased in the sitting position with a gradual increase in the subsequent positions.

III. Discussion

The first point to be discussed is the increase in vital capacity from the lying to the sitting position of the control group in comparison to the decrease in vital capacity of the patient group. In the control group we may say that the increase was due to a decrease in the venous congestion of the pulmonary circulation which allowed more air space in the lungs on assumption of the more vertical position. This has been proposed by several authors. In the patient group, however, the weakness of the abdominal wall may be used as a significant factor. In all of the patients there was not only weakness of the respiratory muscles but also varying degrees of weakness of the abdominal wall which would tend to inhibit the extent of forced expiration obtained.

In the control group one other significant change, prominently displayed, should be discussed, namely, the increase of vital capacity from the lying to the floating position. We should like to offer the following as a possible explanation: When lying out of the water the resistance offered by the plinth prevented the ribs from their excursion backward, even though this movement might

be slight in comparison with the unresisted position of the ribs in the water. According to Polgar the movement of the ribs results from the biaxial construction of the costovertebral joint which allows the head of the ribs to move medialward and the angle of the ribs to move posteriorly. He then comes to the conclusion that the prime motive force essential to inspiration is the extrinsic action of the levatores costarum and not that of the intercostals.

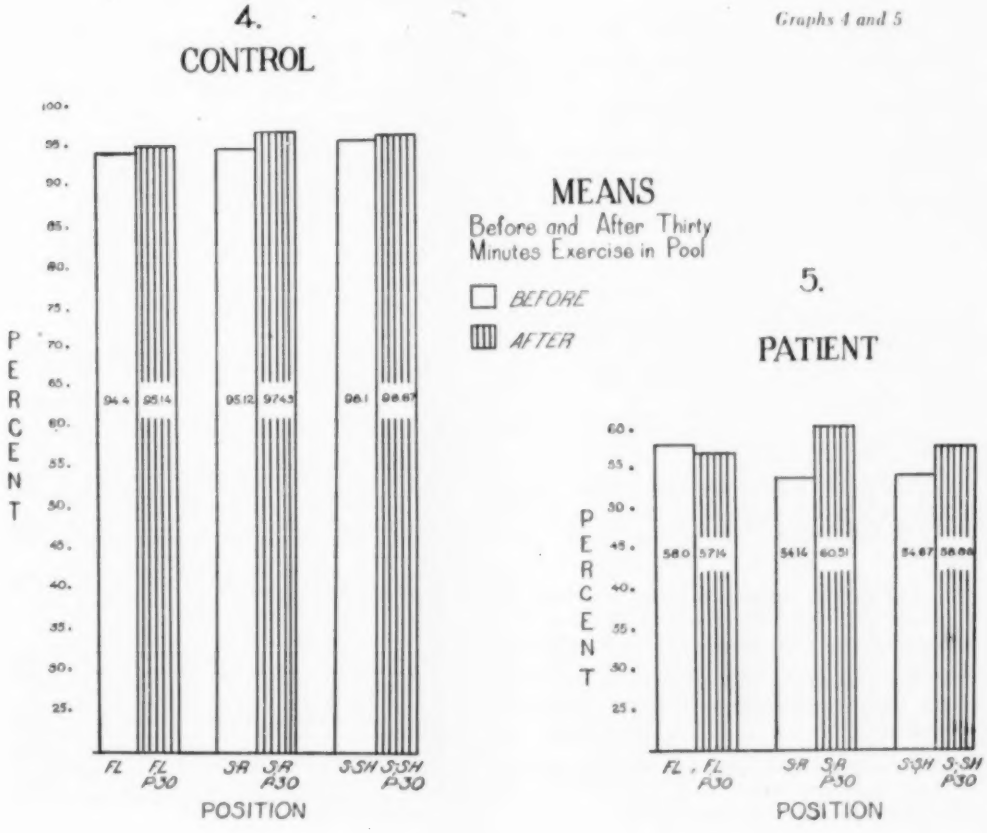
From the lying to the floating position the patient group showed less increase than the control group. This can be fairly easily understood when one considers the generalized weakness of the musculature of the patient group in comparison to that of the control.

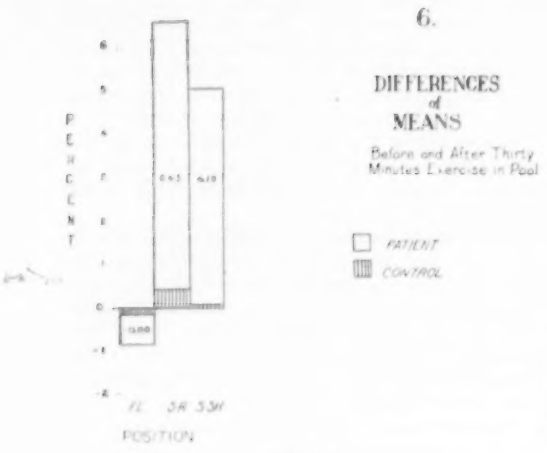
The very significant increase of the patient group in the two sitting positions in the water in comparison to the control group indicates that the patients with moderate to moderately severe weakness do not have great difficulty in the water as some people presume. The increased support given to the abdominal wall when the patient is in the water is a factor which cannot be overlooked, even though the mechanical effect on inspiration should be counterbalanced by that on expiration. The reason for this is the principle of physics which states, "Water pressure increases approximately one-half a pound per square inch as the depth increases one foot."

The best explanation we could give for this increase in vital capacity in the two sitting positions after exercise, was that the buoyancy of the water relieved the weight of the body and allowed the muscles to have increased activity, while the warmth of the water allowed them to relax—thus stretching intercostal muscles possibly tightened from postural habits.

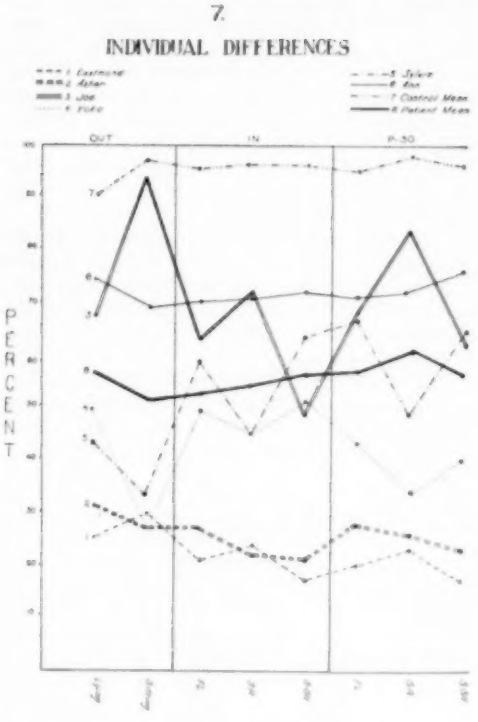
Because (1) a patient's vital capacity increases in all positions in the water over the sitting po-

Graphs 4 and 5





Graph 6



Graph 7

sition out of the water, and (2) the vital capacity increases after exercise leads us to the conclusion that patients, who have a severe amount of weakness in their muscles of respiration and are getting only 20 to 30 per cent of their vital capacity out of the water, need to be watched closely and primarily when they are immersed in water which covers the chest wall.

SUMMARY

A study has been made of two groups, 21 normal persons comprising the control group and 15 persons with varying degrees of weakness of the muscles of respiration, comprising the patient group.

The following results were obtained:

1. The patient's mean vital capacity decreased 4 per cent when changing from the lying to the sitting position, while the control increased 5 per cent.

2. The patient's mean vital capacity increased 3 per cent while sitting in the pool, as compared with sitting out of the pool.

3. The patient's mean vital capacity while sitting in the pool increased after thirty minutes of pool activity.

4. Severely involved persons, when immersed in water over their chest walls, showed a *very marked decrease* in vital capacity.

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Suggestions from the Field*

An Improvised Portable Apparatus for Resistive Exercises in the Home

Esther Snype, B.A.

The Iowa Methodist Hospital has always had a fairly large outpatient service. The majority of these patients are suffering from poliomyelitis. The severe epidemic of 1952 increased the patient loan far in excess of the number which could be handled by our clinical staff and facilities. Thus, of necessity, the home treatment program has been intensified. Through careful instruction and training by the physical therapy staff, the parents have cooperated in setting up in the home a program nearly identical to that given in the physical therapy department, and the results have been very satisfactory.

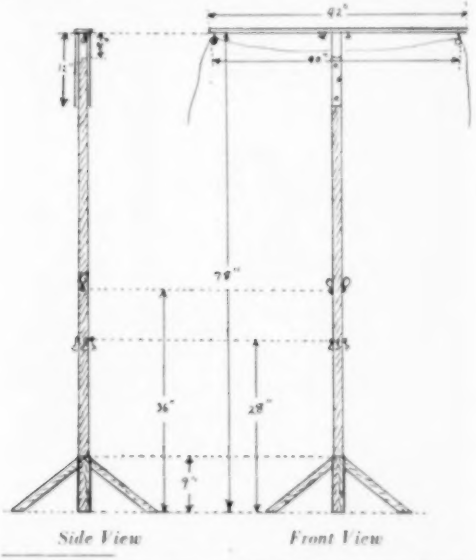
Since resistive exercise is used extensively in the treatment program the parents were assisted in setting up a modified type of apparatus which produced results similar to those obtained on the standard equipment in the physical therapy department. For patients who needed a setup using weights and pulleys, the parents put two pulleys in the doorways when large double doors were available. In other instances some type of overhead bar or frame was constructed on a table. These methods worked fine for the smaller children but difficulties arose when the patients were teen-agers. In some cases only small doors were available, or perhaps the doorways were not the type in which pulleys could be placed. Sometimes landlords would not allow the placing of any hooks or nails in the woodwork.

One day the idea came to me of making a lightweight portable apparatus which could be attached to a table and then be put away when the exercises were over. I wanted something that could be simply and inexpensively constructed.

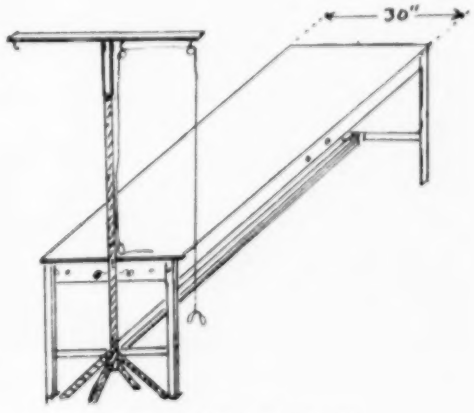
We had a coat rack which was not being used very much and it seemed to be just the thing to modify for the apparatus desired. This particular rack was 72 inches tall, made of 2 by 2 inch lumber, and had a base with four supports.

We removed the coat hooks and increased the length of the rack to 78 inches by adding two pieces of board 2 inches wide and 12 inches long, extending them 6 inches above the top. Another piece of hardwood lumber $3\frac{1}{2}$ inches wide and 36 inches long was fastened across the top. Angle irons were used for reinforcement and greater stabilization. Hooks were screwed in each end of the crosspiece and 13 inches from the ends for the attachment of pulleys. Pulleys were also attached to two sides of the rack 36 inches from the floor.

The apparatus was attached to the table by medium sized screen door hooks which were screwed on to four sides of the rack and about



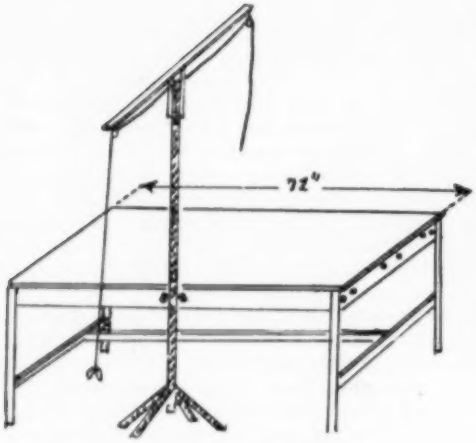
Side View *Front View*



Rack attached to end of table.

Physical Therapist, Iowa Methodist Hospital, Des Moines.

* Physical therapists who have developed or adapted equipment to meet the individual patient needs are encouraged to share their ideas through the Physical Therapy Review.



Rack attached to side of table.

23 inches from the base. This made it possible to attach the apparatus to the side or front of the table. To stabilize the base, hooks were screwed on the legs to hook to the bottom rung of the table. To stabilize the base, hooks were screwed serted were placed on each end, in the center of the table, and at the base (see sketch).

The three photographs illustrate the variability of use and placement of this simple apparatus. The patient lying prone is demonstrating its use in exercising weak quadriceps. In the supine position, the patient is exercising weak hip abductor muscles. The sitting patient demonstrates the position of the device when exercising a weak gluteus maximus muscle. These photographs illustrate only a few of the many exercises which

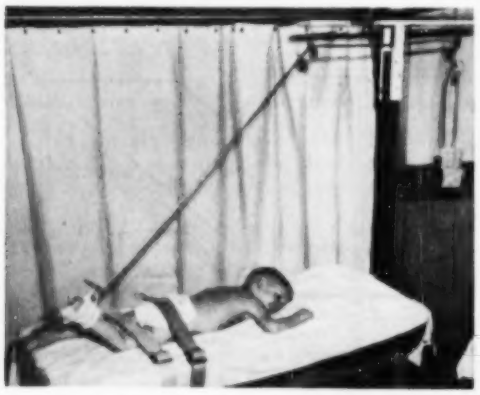


Figure 1. Wide straps are used to distribute the pressure evenly over a large area, thus decreasing the discomfort of a tight band during exercise.

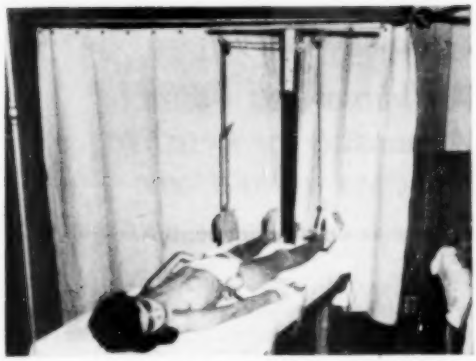


Figure 2. Sling suspension supports extremity and removes the necessity of raising the extremity as well as abducting it. Straps across the opposite thigh and crest of the illium prevent substitution of pelvic movement.

are possible with the use of this apparatus.

I wish to express appreciation to the physical therapy staff of the Iowa Methodist Hospital and Blank Memorial for Children, Des Moines, Iowa, for suggestions and criticisms, and especially to Mr. Ralph Blodgett, our departmental aide, whose mechanical skill and genius made possible both the sketch and the actual apparatus.

This severely involved poliomyelitis patient is getting practice in sitting balance while exercising the lower extremity.

Procedures for the Assignment of Physical Therapists for Poliomyelitis Emergencies

Adopted by the American Physical Therapy Association (APTA) and the National Foundation for Infantile Paralysis (NFIP) on March 1, 1953 for assignment within the United States.

I. Assignment

The following Procedures for the Assignment of Physical Therapists apply when NFIP chapters are expected to participate in payment of salaries of physical therapists needed for the treatment of poliomyelitis patients. Consultant service will be made available by APTA.

The NFIP and APTA desire to assist in seeing that all of the hospital's* polio patients receive adequate physical therapy service. However, every effort must be made to assure the most effective use of physical therapy personnel.

Assignment service for physical therapists for temporary work with polio patients will be given by the APTA upon written request of the administrator of the hospital and approval by the NFIP state representative.

This assignment service is available in times of emergency caused by the incidence of poliomyelitis. It is applicable to acute and immediate post-acute care and not to long-term or convalescent-type care.

A. The need for temporary assignment of physical therapists must be determined by the hospital administrator in consultation with the NFIP state representative.

B. The hospital desiring to employ physical therapists will be expected to first utilize available or transferable personnel within the community.

If the hospital expects the NFIP chapter to underwrite any portion of a physical therapist's salary, the APTA must be notified on application form, PRS-2 of the names and assignment dates of all physical therapists obtained.

C. If the staff cannot be augmented as described, the administrator of the hospital may submit the application form, PRS-2 to the NFIP state representative for approval. This will then be forwarded to the APTA, 1790 Broadway, New York 19, N. Y. Copies of this form may be secured from the state representative or the APTA.

D. All requests under "C" will be given consideration but before a physical therapist is assigned, the hospital requesting assistance will be expected to supply written evidence of the need.

The APTA, to assure an equitable distribution of personnel throughout the country, will evaluate evidence submitted and other data available to them. This, it is recognized, may then result in delay or denial of some requests because of the problem of supply and demand to be met.

II. Qualifications

A. Physical therapists with one or more of the following qualifications will be referred to temporary positions:

1. A graduate of a physical therapy school approved by the Council on Medical Education and Hospitals of the American Medical Association.
2. A member of the APTA.
3. A senior member of the American Registry of Physical Therapists (ARPT).

III. Employment and Personnel Policies

A. Physical therapists assigned by the APTA become employees of the hospital to which they are assigned. *Neither the National Foundation nor The American Physical Therapy Association is the employer of these physical therapists.* It is the responsibility of the hospital to orient physical therapists to the hospital program.

Since these physical therapists will be employed by the hospital, it is expected that the privileges of sick leave and state workmen's compensation, if extended to the professional staff employed regularly by that institution, will be extended to assigned physical therapists.

* These Procedures cover service to agencies as well as to hospitals. Wherever the word "hospital" is used, the word "agency" may be substituted.

Assigned physical therapists are considered temporary employees and are not entitled to vacations with pay.

B. Length of temporary service:

Physical therapists assigned by the APTA from outside the community agree to serve for a minimum period of three months, though, they may be released at an earlier date, if no longer needed.

Requests for an extension of the temporary assignment period, not to exceed an additional three months, must be supported by written evidence of continuing need. This justifying information must be filed with the state representative of the NFIP together with form, PRS-2E for his approval and, further transmission to the APTA. Form PRS-2E and the justifying information must be received by the APTA at least ten days before termination of the original assignment period. The APTA will evaluate and decide on the possible extension of the assignment.

NOTE: The NFIP will not underwrite the cost of return transportation unless an official extension has been granted.

C. Hours of work:

The physical therapist shall work the regular institutional hours of the hospital to which he or she is assigned. Not less than 40 hours and not more than 48 hours of duty per week is considered a reasonable work week.

D. Salaries:

Assignment salaries have been determined by NFIP in consultation with APTA. They are:

1. $250.00 per month for new graduates.
2. $285.00 per month for physical therapists after one year's experience.
3. Physical therapists obtained locally for part-time work may be paid a prorated salary, based on the above classifications.
4. In certain situations it may be necessary to assign a physical therapist who has special qualifications in preparation and experience. In such circumstances decision upon the amount of salary will be made by the APTA in conference with the Medical Department of NFIP headquarters.

The APTA will make decisions on an individual basis as to which of the above salaries should be paid to any assigned physical therapist.

Payment of salary should be made by the hospital in accordance with the regular pay period for professional staff in that hospital. The physical therapist's salary shall start at the time of reporting on duty, but, in any event, not later than 24 hours after reporting her arrival to the hospital.

Physical therapists assigned fora three-month period, who are released by the hospital prior to the completion of assignment, shall receive one week's notice or one week's salary. However, physical therapists leaving assignments of their own accord prior to completion of three month's service, shall be paid through the last day of service.

The hospital shall pay its established starting salary to any assigned physical therapist. If such personnel are not regularly employed, the administrator and the state representative, with the advice of the APTA, shall arrive at a rate to be paid by the hospital which is consistent with practice in the area. NFIP chapters will reimburse the hospital for the difference between its salary payment and the full assigned salary.

In the event that a hospital certfiies its inability to pay its share of the salary for assigned physical therapists, including a written statement of reason therefor, the hospital or agency requesting the assignment will utilize the prescribed procedure for application for a grant from the Epidemic Aid Fund to meet this need. This request will be decided by the NFIP Medical Department, National headquarters prior to assignment of any requested physical therapists.

NFIP chapters will not reimburse hospitals for any portion of physical therapists' salaries unless physical therapists have been processed by use of form PRS-2 or PRS-2E through the application and assignment procedure, as outlined herein.

E. Withholding tax, Social Security and insurance:

Federal income tax on salary and maintenance of assigned physical therapists, as for other hospital employees, will be withheld by the hospital according to government regulations. At the termination of employment, the hospital will furnish withholding tax statements to assigned physical therapists.

Social Security coverage is subject to the policy in practice in the hospital, and to government regulations. Any questions regarding Social Security should be referred to the hospital administration.

The NFIP has insurance coverage for assigned physical therapists who contract polio. This insurance covers medical and hospital expenses, within limits, as well as a weekly indemnity for a specified period. If a chapter participates by subsidy in any part of a physical therapists' salary, form PRS-2 must be processed as outlined herein and only by this procedure will a physical therapist qualify for eligibility for insurance coverage in case of contracting polio.

The hospital is expected to notify NFIP, Medical Services Division, 120 Broadway, New York 5, N. Y., upon the admission and diagnosis of poliomyelitis of any such personnel.

F. Maintenance:

1. Physical therapists assigned from outside the community should receive maintenance to include lodging, meals, and laundry of uniforms at the hospital, if at all possible.

   If suitable living facilities are available at the hospital, assigned physical therapists are expected to utilize these facilities.

   The NFIP chapters are authorized to reimburse the hospital for the actual cost of such maintenance, but not to exceed $100.00 per month.

2. When suitable maintenance is not available at the hospital for physical therapists assigned from outside the community, allowance of $100.00 per month will be paid to each physical therapist by the hospital to be applied toward her maintenance costs as partial compensation for living away from home.

   NFIP chapters are authorized to reimburse the hospital for this monthly maintenance allowance.

   When living accommodations for physical therapists are not available in the hospital, accommodations in the community should be arranged for them in advance by the hospital.

3. Physical therapists assigned to serve in their own community by the APTA, will pay for any meals or laundry received at the hospital, unless the hospital wishes to furnish such services without charge.

IV. Supervision

A. Medical:

No physical therapists will be assigned unless medical direction is assured. All physical therapy must be prescribed in writing by a physician.

B. Physical Therapy:

Recent graduates or physical therapists with no experience in the care of polio patients will be referred only to facilities where qualified physical therapy supervision is available.

If the hospital cannot provide a qualified therapy supervisor, the APTA will assist in obtaining a physical therapist with supervisory experience and ability for the assignment.

Qualified physical therapists may not work under the supervision of an unqualified physical therapist.

V. Travel Expense

A. Travel expense from place of obtainment to place of assignment will be paid by the APTA. Return travel expense to place of obtainment or equitable amount applying to other location will be paid unless the physical therapist —

1. Leaves of own accord prior to termination date of assignment.
2. Leaves assignment for vacation, holiday, or any unauthorized leave.
3. Remains beyond termination date of assignment without authorization of the APTA.

B. Such travel expense is to include: Cost of plane, bus, or train (including Pullman) accommodations, plus an allowance of $10.00 per day (24 hours) while traveling, in lieu of salary and expenses such as meals en route, taxis, tips, baggage costs, and purchase of travel insurance by the physical therapist. In addition, the cost of lodging, if necessary, between planes, buses, or trains, not to exceed $5.00 per day, will be allowed.

C. If physical therapists travel to their assignments by car, the APTA will pay expenses at the rate of 7¢ per mile. (This should not exceed expenses for travel by plane or train, whichever is greater). When traveling by car, the allowance of $10.00 per day will be allowed only for the same number of days necessary to reach destination by train. Expenses for additional time, because of preference of travel, are to be absorbed by the physical therapist.

D. Travel expense, as outlined, shall be reimbursed by the NFIP headquarters office to APTA.

Editorials

THE YEAR 1952 appeared to be an ominous one to many of us with its unprecedented number of 57,628 new polio cases reported. Omnious partly because the increase of new cases each year has continued so persistently and the trends indicate that the number may be greater this year. But, in retrospect, 1952 was a year of great progress towards the eventual control of poliomyelitis, and in our ability to improve the skills required in managing its after effects. With the leadership of the National Foundation for Infantile Paralysis coordinating action through group thinking and planning, projects were carried forward and patient care needs were met to a surprising extent in crisis after crisis.

The American Physical Therapy Association shouldered its responsibility as a professional organization. In many states our chapters grasped the initiative in locating and coordinating the services of physical therapists on a part-time or full-time basis in hospitals and clinics struggling with a staggering polio patient load. Vacations were terminated, priorities within established departments were accepted, inactive physical therapists volunteered during the emergency period, and new graduates from schools of physical therapy accepted temporary assignments willingly and promptly.

Physical therapists were sent for temporary assignments during the epidemic period to twenty-eight states and to Alaska. Three members of the American Physical Therapy Association played a significant part in the now historically famous gamma globulin project, and a brief account of their activities appears in this issue of the *Review*.

Already 1953 appears to be a year of great expectations. Regional workshops for nurses have been held in twelve areas with physical therapists participating in each. A conference of physical therapists representing the Regional Respiratory Centers has explored the responsibility of the physical therapist in the management of the polio patient in the respirator. The Polio Assignment Service of the American Physical Therapy Association has been pooling resources for physical therapists who are available or who can be made available for epidemic service. The National Red Cross is putting its "all" in an effort to obtain necessary human blood for processing, and gamma globulin will be distributed through the Office of Defense Mobilization to State and Territorial Health Departments for local use. It is recognized that gamma globulin has not been accepted as the final answer to polio problems, and studies for the production of a polio vaccine will continue.

As we go to press, the number of new cases of polio reported for 1953 is greater than in 1952 at this time of year. What can we do as individual physical therapists?

1. Take an active part in your chapter in any preplanning program in readiness for a polio emergency.
2. Anticipate and plan for the possibility of an increase in a polio patient load during the usual season in your area.
3. Give a pint of blood as often as medically indicated at your nearest blood bank.
4. If you have been inactive, try to arrange to help at your nearest medical care or health center.
5. If you can help outside of your home territory write to the

Polio Assignment Service, American Physical Therapy Association
1790 Broadway, New York 19, New York

Physical Therapists in Respiratory Centers

The National Foundation for Infantile Paralysis sponsored a Poliomyelitis Equipment Conference, May 28 and 29, at the Roosevelt Hospital in New York City. Physicians, physical therapists, and nurses representing the Regional Respiratory Centers met with manufacturers of equipment used in these centers to discuss problems, possible improvements, as well as all services to be considered in the management of poliomyelitis patients with respiratory difficulties.

Physical therapists representing the respiratory centers in Los Angeles, California; Houston, Texas; Ann Arbor, Michigan; Louisville, Kentucky; Boston, Massachusetts; and the Professional Services Consultants of the National Office had an opportunity to meet together on the afternoon before the conference sessions as well as in separate group meetings during portions of the two day period. Representatives from the field of occupational therapy and social work, who participated in the program, made valuable contributions to the general and group meetings. The meeting provided the first opportunity to discuss common problems and share experiences which are unique in respiratory centers. The participants discussed the following:

I. Duties of physical therapists in the respiratory units
   - A. Tests and measurements being requested for the clinical evaluation and reporting of patient's progress with revision of forms and records used
   - B. Treatment procedures and technics being prescribed with consideration of adaptation of methods applied

II. Responsibilities of the physical therapist in the comprehensive care of the patient
   - A. Relationship with co-workers
   - B. Scheduling treatment program in relation to individual patient needs and efficient use of personnel
   - C. Maintaining continuity of care through staff conferences
   - D. Understanding all aspects of patient's care (physical, psychological and environmental)

III. Staffing the physical therapy department
   - A. Desirable ratio of patients to physical therapist
   - B. Use of nonprofessional assistants
   - C. Rotation of staff.

IV. Planning for patient's transfer or discharge to home
   - A. Quality and quantity of family instruction
   - B. Interagency referral systems

V. Establishing follow-up programs
   - A. Outpatient services
   - B. Extension of hospital services
   - C. Cooperation with public health nursing facilities

VI. Meeting educational needs for physical therapists
   - A. Desirable qualities of physical therapist working in respiratory center
   - B. Implications in the undergraduate preparation
   - C. Orientation program for new staff
   - D. Instaff education program
   - E. Postgraduate programs

It is anticipated that this first meeting of physical therapists will assist in providing the ways and means of clarifying the physical therapist's duties and responsibilities as well as improving skills required in the care of the poliomyelitis patient with respiratory problems.

Physical Therapists Participate in Work Conferences on Polio Nursing

There have been interesting and enthusiastic reports from many of our members who accepted the invitation to assist in the workshops which were sponsored by the Nursing Advisory Services for Orthopedics and Poliomyelitis of the National League for Nursing.

The conferences were attended by approximately 700 nurses representing hospitals, schools of nursing, and public health agencies within the respective regions. A ten-day period was spent in lecture, demonstration, discussion and practice of the nursing care required for the poliomyelitis patient from the onset of the disease through the reconstructive stage. Correlation of services for effective patient care from the hospital to the home was discussed. Ways and means of integrating the important aspects of the care of the poliomyelitis patient in the preparation and experience of nurses were considered.

The following physical therapists participated at the twelve regional conferences listed:

Eleanor Wescott	Denver
Beatrice Vlahos	Atlanta

Dorothy Dean	Chicago
Ruth Montieth	Kansas City, Kans.
Ingrid Sinervo	Louisville
Margaret O'Neil	New York
Mary Elizabeth Rexroad	Oklahoma City
Miriam Jacobs and Virginia Whitfield	Pittsburgh
Helen Buchanan and Carol Spensley	Mitchell, S. Dak.
Elizabeth Speltz	Memphis
Aline Bletcher and Elsie Bond	San Antonio
Helen Blood	Salt Lake City

U. S. Public Health Service Report

Number of Cases of Infantile Paralysis Reported, United States

Date	1953	1952 *comparable period*
Latest week (Ended May 30, 1953)	198	145
Previous week (Ended May 23, 1953)	154	122
Calendar year to date	2,569	2,047

Statistical Services Department reports:

"According to the U.S. Public Health Service, there were 198 cases of polio reported for the entire country during the week ended May 30. This total represents an increase of 29% over the number of reported cases in the previous week; is 37% larger than the number in the same week of 1952; and exceeds by 55% the average volume of reported cases during the corresponding week of the past five years.

"The total number of cases reported during the first five months of 1953 is 2,569, an increase of 26% over the number in the comparable period of last year and more than half again as large as the average number in the first five months of the years 1948-1952. These sharp increases may be explained in part by the relatively large number of polio cases associated with the major 1952 epidemic, reported during the first few weeks of 1953.

"To date, the highest case rates per 100,000 population have been reported in Nevada and Utah, 13.9 and 9.2, respectively. Approximately 28% of all cases were reported from California, while nearly one-fourth of the cases for the current reporting week were located in Texas."

Do you have these in your reference library?

1. **Muscles, Testing and Function.** Henry O. Kendall and Florence P. Kendall. Cloth binding; price $7.50. Pp. 279; illus. Williams and Wilkins Company, Baltimore, 1949.

2. **Muscle Testing, Techniques of Manual Examination.** Lucille Daniels, Marian Williams, Catherine Worthingham. Pp. 189; illus. W. B. Saunders Company, Philadelphia, 1946.

3. **Therapeutic Use of Pools and Tanks.** Charles L. Lowman, M.D., D.Sc., and Susan Roen. Spiral binding. Pp. 90; illus. 196. W. B. Saunders Company, Philadelphia, 1952.

4. **Physical Rehabilitation for Daily Living.** Edith Buchwald. Price $7.50. Pp. 182; illus. McGraw-Hill Book Company, New York, 1952.

5. **Protective Body Mechanics in Daily Life and in Nursing.** Manual for Nurses and their Co-Workers. Margaret Campbell Winters. Price $3.00. Pp. 150; illus. W. B. Saunders Company, Philadelphia, 1952.

6. Special Poliomyelitis Issues of:
   American Journal of Physical Medicine, Vol. 31, Number 4.
   Physical Therapy Review, July 1952, Vol. 33, Number 7.

7. **Orthopedic Appliance Atlas.** Vol. I. Compiled by American Academy of Orthopaedic Surgeons, Surgeon General, U. S. A., and Veterans Administration, Department of Medicine and Surgery. Price $10.00. Pp. 588; illus. Edward Brothers, Ann Arbor, Michigan.

8. **Source Book on Poliomyelitis 1951**
   Prepared by Staff of Federal Security Agency and National Foundation for Infantile Paralysis. Pp. 68. Available from U. S. Public Health Service, Washington 25, D. C.

Unique Foundation Helps Solve Shoe Problem of Crippled

Paralytics, amputees and persons with mismated feet who have to buy two pairs of shoes to get a single pair or two shoes when only one is needed will be glad to hear about a unique Benefit Shoe Foundation in Bristol, R.I.

A nonprofit organization, the foundation was created recently as a "humanitarian service" for the purpose of selling shoes to these persons, giving them the advantage of purchasing single shoes if desired, or odd sizes, according to Dale D. Dutton, president.

It was established by an unnamed business concern which received an appeal through the National Foundation for Infantile Paralysis concerning the shoe-fitting problem of persons with orthopedic impairments and amputees.

The corporation provides for the expenses of the foundation. Profits from the sale of shoes will be directed to humanitarian and national welfare agencies, Mr. Dutton said.

Association Activities

World Confederation for Physical Therapy

Donations to the World Confederatoin for Physical Therapy have been received from the following chapters since the listing of the April donations in the May issue of the Review:

Alabama	$ 10.00
Colorado	25.00
Connecticut	76.00
Delaware	12.00
Georgia	50.00
Illinois	25.00
Massachusetts	144.50
New York	100.00
North Carolina	20.00
Ohio	15.00
Tennessee	33.00
West Virginia	20.00

Members of the American Physical Therapy Association attending the World Confederation Congress, whose names have been received since the last listing:

Marguerite G. Dilley
Helen M. Staats
1/Lt. Betty J. L. Seifert
Mrs. Georgia Traub
Sara MacLean Walker

Association Representative on Navy Cruise

Mary Nesbitt, Vice-President, represented the Association in a tour to Pearl Harbor planned by the United States Navy for several professional organization officers including the National League for Nursing, and the American Nurses Association, Inc.

The group left Washington on May 15th on a Military Air Transport Service flight and sailed from Long Beach, California on the hospital ship U.S.S. Repose on May 17th. They arrived in Pearl Harbor on May 23 where they were briefed on the naval situation in the Pacific and visited naval and military installations.

The return from Honolulu was on the Navy's MARS flying boat which arrived in San Francisco on May 31st.

Miss Nesbitt hoped to meet with the members of our Hawaii Chapter while she was in Honolulu.

Report on a Trip to Europe

Metta Baxter, of Los Angeles, combined business with pleasure in a six weeks' visit to several European countries the first of this year. She has sent us the following letter about her visit. Miss Baxter urges those who will be attending the Congress of the World Confederation for Physical Therapy in London also to plan to visit the continent.

"Miss Elson's suggestions for professional visits while in Europe reached me just before I left New York. These proved very useful, and anyone going to the continent might want them. The list is as follows:

M. Andre Nicole, President
Comite Nationale Des Masseurs
Kinesitherapeutes Francois
18, rue de Vieux Columbier, Paris 6

Miss M. J. Neilson, Secretary
The Chartered Society of Physiotherapy
Tavistock House (South)
Tavistock Square, London, W.C. 1

Miss Ginette Elmiger
Halden Strasse 23
Luzern, Switzerland

Miss Edith von Lieven
Berlin Wilmensdorf
Deidesheimerstrasse 11

"As I went primarily to try the skiing, my time was limited in each of these countries, so I con-

tacted these therapists and they advised me how best to spend what time I had.

"Mr. Nicole sent me to a children's hospital which also had a physical therapy school. The hospital was, Clinique Chirurgicale Infantile and Orthopedie Hospital Des Enfants Malades, 149, rue de Sevres, Paris (15e). Although Madame Raymand speaks only French and I speak only English, we made a tour of the hospital without an interpreter! The school was not in session, as it was a holiday similar to our Mardi Gras, but I was given a brochure describing the course as, 'Cours de Gymnastique Medicale, de Reeducation Fonctionnelle et de Massage.'

"Not knowing where to go in Vienna, I went to the University of Vienna Medical School Hospital. With the aid of my American Physical Therapy Association card, I visited the Physical Therapy Clinic of the Surgical and Neurological Section of this large hospital. The clinicians are using ultrasonics to a great extent here and seem very pleased with the results. This hospital has four physical therapy clinics for the various sections of the hospital and this was the largest, treating approximately 200 patients a day. The school, which has twenty students, offers a two year course.

"A trip to the continent is not complete without a trip to Switzerland. A trip to Switzerland *must* include Luzern and a visit with Miss Elmiger, a native of Switzerland, and a member of the American Physical Therapy Association. I'll admit that we were carried away with this city and our Association member's hospitality. I speak now of 'when I return to Luzern', for I left this beautfiul little city and its wonderful people with a very strong desire to go back as soon as possible.

"While in Luzern, I was privileged to observe Miss Elmiger in her clinic treating several cases of scoliosis. She has developed a type of reflex massage plus a technic of resistive exercise which impressed me very much. She should be urged to publish material on this subject, although, after observing the strenuous routine which she follows, I agree with her that she doesn't have time. All material on this type of reflex massage is written in German, but if anyone has a translation of the first of these books, 'Massage reflektorischer zonen in Bindegewebe die rheumatischen und inneren Erkrankungen,' by von Dr. Hede Leube and Elisabeth Dicke, published in 1948, I would like to borrow it.

"Miss Elmiger teaches three mornings a week at the Physical Therapy School of the University of Zurich, but previous plans prevented my going with her to learn more about this new technic which she has further developed.

"I managed a short visit with Miss Neilson while stopping overnight in London, or I should say, she managed time to see me as she was very busy in the midst of plans for the World Confederation for Physical Therapy. From all reports it will be a stimulating conference. I had one afternoon to visit a hospital in London, and was glad when Miss Neilson agreed that St. Thomas Hospital would be the best to see in that immediate area. The therapists in the physical therapy department here were busy, but they were very nice and showed me through the department. They were already aware of the extensive use of ultrasonics in Vienna.

"I found my last stop on the trip especially interesting as I revisited Walter Reed Hospital in Washington, D.C., and went on a tour of the Army Prosthetics Research Laboratory as well.

"Everyone was extremely kind, cordial, and helpful to me on this trip and I am looking forward to a more extensive trip with emphasis on physical therapy and rehabilitation centers.

"Incidentally, the skiing was even better than I had imagined it could be."

Chapter News

Northern Indiana

The Chapter was in charge of the physical therapy section meeting of the Tri-State Hospital Assembly in Chicago on May 7th. Physical therapists from Wisconsin, Michigan, Illinois and Indiana were present.

Missouri

The Missouri Physical Therapy Association, Inc., which is composed of the Eastern and Western Missouri Chapters, held its annual meeting in Kansas City on April 26th and 27th in conjunction with the Missouri Medical Association. The two day session included a business meeting, banquet and one day program of professional speakers.

Pennsylvania Physical Therapy Association, Inc.

The Chapter planned the physical therapy section program for the annual meeting of Middle Atlantic Hospital Assembly in Atlantic City, May 21st.

Members were present from New York, New Jersey, Delaware and Pennsylvania.

Utah Chapter

The Chapter was in charge of the physical therapy section meeting of the Western Hospital Association in Salt Lake City on April 28th. The theme of the meeting was of broad interest, "The Value of a Physical Therapy Department" to a specialist, the nursing staff and the hospital administrator.

Washington

The Chapter has recently completed a salary survey of the state and has published "Personnel Policies for Professional Physical Therapists." Other chapters who are contemplating similar surveys would benefit by corresponding with the Committee Chairman, Erma C. Myers, 306 Northgate Building, Seattle 55, Washington, and reading the report.

State Legislation in Oklahoma

Oklahoma became the 17th state to have a registration law for physical therapists when the Oklahoma Physical Therapists Practice Act was signed by Governor Murray on May 7. The bill was passed unanimously by the House of Representatives in spite of opposition from outside.

Arkansas Chapter Co-Sponsor of Polio Institute

A Polio Institute was held May 19-20, 1953, in Little Rock, Arkansas. It was sponsored by the Arkansas Medical Society, Academy of General Practice, League for Nursing, Association of Occupational Therapists, Pulaski County Chapter of the National Foundation for Infantile Paralysis and the Arkansas Chapter of the American Physical Therapy Association.

On the first day, the following program was given:

Presiding—S. B. Thompson, M.D.

Address of Welcome—Honorable F. E. Cherry, Governor, State of Arkansas

Epidemiology, Recent Advances and Research—John P. Fox, M.D.

Diagnosis and Treatment in Acute Stage—A. J. Steigman, M.D.

Current Nursing Practices in Polio Care—Evelyn Hamil

Patients with Respiratory and Bulbar Impairment—A. J. Steigman, M.D.

Orthopedic Care in Acute and Convalescent Stages—D. L. Eyler, M.D.

The Physical Therapist's Role in Polio Care—Lucy Blair

Psychological Care of the Polio Patient—M. A. Seidenfeld, M.D.

Management of Patients with Residual Paralysis—D. L. Eyler, M.D.

Arkansas Facilities for Polio Patient Care—S. B. Thompson, M.D.

Distribution of Gamma Globulin in Arkansas—A. M. Washburn, M.D.

The second day was devoted to clinical demonstrations in nursing, occupational therapy and physical therapy procedures which are used in the early, convalescent, and adaptation stages of the patient with poliomyelitis. Members of the Arkansas Chapter of the American Physical Therapy Association with the support of their patients carried on an excellent demonstration with narration of the various procedures and the steps in progress towards the rehabilitation of the poliomyelitis patient.

Patient's Tribute to Her Physical Therapist

The death of Florence Case, Nebraska physical therapist, was felt in this area. An article by one of her polio patients can best describe the love and respect the patients had for her. The patient, Peggy Ashcraft, had a severe involvement requiring assistance of a respirator. Nevertheless, she does the column for a local paper at Broken Bow through the use of a dictaphone.

Occasionally we are privileged to know persons whose devotion to their chosen field causes them to create, without realizing it, a living memorial to themselves. Miss Florence Case, whose sudden death last Monday shocked so many Nebraskans, was such a person.

"Casey," as she was affectionately known by patients and co-workers, has left an impression which will never be forgotten by those with whom she came in contact during her nursing and physical therapy career. For the past five years, Florence Case has been therapist at the St. Francis hospital in Grand Island. To polio patients she became a friend as well as a therapist.

With her treatment she gave encouragement which meant as much as the skill with which she

attempted to restore the muscles whose use had been stolen by the crippling disease. During the epidemic which crowded the hospital last summer and fall, Casey worked tirelessly seeing that each patient received as much attention as could possibly be given. The physical therapy department at the hospital has grown under her direction until Central Nebraska has at hand as complete a therapy department as can be found in many more populous areas.

Yes, Casey left many memorials. The department itself and each of those who have gone through that department, the polio patients who are able to walk a little better and do a little more because of her skill and deep personal interest. Most of us could live to be 90 and never do more for our fellow man than Florence Case did in the short span allotted her.—from *Coffee Cup Chatter* by PEGGY ASHCRAFT

Courses in Poliomyelitis Care for Physical Therapists

Georgia Warm Springs Foundation, Warm Springs, Georgia. The course is devoted to the convalescent care of the poliomyelitis patient following the acute stage, and includes lectures, demonstrations, and supervised practice.

A three-months' course begins on July 1 and October 5. For additional information write to Robert L. Bennett, M.D., Director of Physical Medicine.

Children's Medical Center, 300 Longwood Avenue, Boston, Massachusetts. The course is planned to provide instruction and experience in the comprehensive care of the poliomyelitis patient. A study period of four weeks, three months, or six months is beginning on July 6. For additional information write to Shirley Cogland, Director of Physical Therapy.

Southwestern Poliomyelitis Respirator Center, Jefferson Davis Hospital, Houston, Texas. Physical therapy procedures in the comprehensive treatment of the cardio-respiratory poliomyelitis patient are considered in relation to the physiological, psychological, and sociological implications. Courses of four weeks are starting on June 30, August 3, August 31, September 28, and October 26. For additional information write to Laura K. Smith, Supervisor of Education.

University of Southern California, 3518 University Avenue, Los Angeles 7, California. The Physical Therapy Department in cooperation with Los Angeles County Hospital and Rancho Los Amigos Respiratory Center for Poliomyelitis are sponsoring workshop-type studies in the treatment of the acute and respirator patient in the hospital and the home. Sessions in the evening, twice a week, and Saturday morning will be started on April 18, 1954. For additional information write to Charlotte W. Anderson, Director of School of Physical Therapy.

Georgia Warm Springs Foundation Appoints New Medical Director

Basil O'Connor, president of Georgia Warm Springs Foundation, today announced the appointment of Robert L. Bennett, M.D. as medical director of that institution.

Dr. Bennett has been the assistant medical director in charge of physical medicine at Warm Springs for many years. He is also professor of physical medicine at Emory University School of Medicine, secretary-treasurer of the American Board of Physical Medicine and Rehabilitation, and past president of the American Congress of Physical Medicine and Rehabilitation.

Drs. C. E. Irwin, H. S. Raper, and Thomas Gucker, III, will continue in their present positions as director of orthopedic surgery, director of internal medicine, and assistant director of orthopedic surgery, respectively, and Dr. Harry W. Mims will serve as assistant director of physical medicine and rehabilitation.

Mr. O'Connor further announced that the increasing demands for patient care, plus the ability of most communities to handle the after-effects of poliomyelitis, have made it advisable to provide an evaluation service for physicians referring patients to Warm Springs. This clinic-type service is designed to assist the local physician in the more complete care of the patients.

Georgia Warm Springs Foundation will continue to treat polio patients through the inpatient services of physical medicine and orthopedic surgery. Patients will be carefully selected to provide a wide variety of problems for professional training and clinical research.

The facilities of Warm Springs still will be devoted primarily to the care of the after-effects of poliomyelitis, although other problems resulting in physical handicap requiring similar rehabilitative measures will be studied.

Membership News

Mrs. Sally Keetch

Mrs. Sally Geneva Keetch of Salida, Colorado, died of a cerebral hemorrhage late in February. Before going to Colorado, she was a charter member of the Missouri Chapter and had served for several terms on the chapter's executive committee. Mrs. Keetch was employed at Children's Mercy Hospital in Kansas City, Missouri, for many years, and more recently, in the physical therapy department of the Denver and Rio Grande Western Railroad Hospital in Salida. She had built her home in that city and planned to retire soon.

Marriages

Ellen M. Luoma of North Hollywood, Calif., now Mrs. Ellen L. Stephenson, Redondo Beach, Calif.
Janet Vogl of Madison, Wis., now Mrs. Janet V. Engebretson, Beloit, Wis.
2/lt Lorraine Kovach of Ft. Sam Houston, Texas, now 2/lt Lorraine K. Reisinger, Ft. Sam Houston, Texas.
Susanne Seely of Cleveland Heights, Ohio, now Mrs. Susanne S. Jackson, Cleveland, Ohio.
Mary Geoghegan of Framingham, Mass., now Mrs. Mary G. O'Rourke, Boston, Mass.
Elizabeth Lomelino of Kansas City, Mo., now Mrs. Elizabeth L. Elliott, Kansas City, Mo.
Ann Ritsher of Warm Springs, Ga., now Mrs. Ann R. Berbary, Dallas, Texas.
Shirley L. Hornbeck of San Diego, Calif., now Mrs. Shirley H. Phillips, San Diego, Calif.
M. Jean Murphy of Dorchester, Mass., to Joseph P. De Vito, Stoughton, Mass.
Elizabeth Williams of Needham, Mass., now Mrs. Elizabeth W. Ivins, Boston, Mass.
Mary Spring of Orlando, Fla., now Mrs. Mary S. Wilson, Durham, N.C.
Lt. Roberta Wallace of El Paso, Texas, now Lt. Roberta W. Simonson, El Paso, Texas.
Lt. Elizabeth Osborne of Ft. Bragg, N. C., now Lt. Elizabeth O. Sandel, Ft. Bragg, N. C.
Reeta L. Sedgwick of Los Angeles, Calif., now Mrs. Reeta L. Mattison, Los Angeles, Calif.
Marilyn Sheehan of Wollaston, Mass., now Mrs. Marilyn S. Barry, Wollaston, Mass.
Edna Tilden of Portsmouth, Va., now Mrs. Edna T. Townsend, Portsmouth, Va.
Bette S. Ponting of Chicago, Ill., now Mrs. Bette S. Horstmann, Chicago, Ill.
Marilyn Ring of Swampscott, Mass., now Mrs. Marilyn R. Blackburn, Swampscott, Mass.
Mary C. Pert of Tenafly, N. J., now Mrs. Mary P. Breece, Bergenfield, N. J.
Mary Moxley of Brantley, Ala., now Mrs. Mary M. Weed, Brantley, Ala.
Anna Mumma of Wynnewood, Pa., now Mrs. Anna M. Heermann, Wynnewood, Pa.
Jean McRoberts of Canton, Mo., now Mrs. Jean M. Wood, Springerville, Ariz.
Mary A. Henry of Iowa City, Iowa, now Mrs. Mary H. McCullen, Iowa City, Iowa.
Leslie Griffin of Sandwich, Mass., now Mrs. Leslie G. Woodfin, Sandwich, Mass.
Dorothy Grant of Long Beach, Calif., now Mrs. Dorothy G. Anderson, Long Beach, Calif.
Margaret Gardipee of Sacramento, Calif., now Mrs. Margaret G. Wheeler, Crown Point, Ind.
Beatrice Fugina of Fargo, N. D., now Mrs. Beatrice F. Eveleth, Fargo, N. D.
Doris J. Darkey of Pittsburgh, Pa., now Mrs. Doris D. Kuhns, Pittsburgh, Pa.
Celia Craig of Columbus, Ga., now Mrs. Celia C. Robson, Columbus, Ga.
Nancy R. Butler of Baltimore, Md., now Mrs. Nancy B. Turlingten, Baltimore, Md.
Lena Langella of Brooklyn, N. Y., now Mrs. Lena L. De Simone, Brooklyn, N. Y.
Isobel Logan of Conneautville, Pa., now Mrs. Isobel L. Knoepfli, Conneautville, Pa.
Ruth Martin of Belmont, Mass., now Mrs. Ruth M. Keans, York Village, Maine.
Mary M. Kuhnert of Dallas, Texas, now Mrs. Mary K. Ray, Dallas, Texas.
Harriet Watts of Hillside, Ill., now Mrs. Harriet W. Holbrook, Sacramento, Calif.
Elva Piermarini of Concord, Mass., now Mrs. Elva P. Parson, Concord, Mass.
Muriel Graslie of St. Paul, Minn., now Mrs. Muriel G. Hoff, St. Paul, Minn.
Elaine Hogan of Dayton, Ohio, now Mrs. Elaine H. Stroup, Dayton, Ohio.
Mary Rose D'Anna of Los Angeles, Calif., now Mary D. Winkler, Los Angeles, Calif.
Ellen Holcomb of San Luis Obispo, Calif., now Mrs. Ellen H. Conklin, San Luis Obispo, Calif.

School News

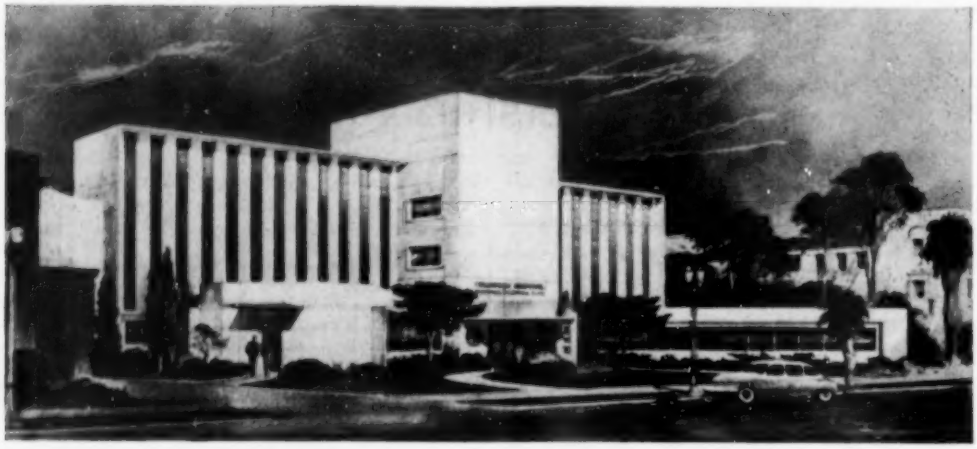
New Student Members

Boston University

Joan M. Douglas
Jean C. Gilman
Kathleen E. Rice
Mary Ross
Elsie M. Saunders
Mary P. Siragusa
Mary S. Tagliente

Columbia University

Aelita-Arija Geske



The Childrens Hospital Society School of Physical Therapy is located on the ground floor of the building on the extreme right in the photograph.

Series on Schools

Childrens Hospital Society

School of Physical Therapy

The Childrens Hospital Society School of Physical Therapy is one of the oldest schools in the country, having been founded by Miss Lily H. Graham on an apprentice basis soon after World War I. The first formal class was held in 1923, and with two classes a year during World War II the number has reached 35 including the one now in session. Since 1946 the school has been affiliated with the University of California at Los Angeles.

In 1949 the Los Angeles Junior League rebuilt a part of one of the buildings of the hospital for the use of the school, and the theory classroom, physical therapy library, anatomy laboratory, and offices are conveniently located together in this area. The practice classroom adjoins the physical therapy department in the main building where observation of clinics and participation in patient treatment are available. A fine treatment pool is a part of the equipment of the department and is used for classes in underwater therapy. Childrens Hospital is a rapidly growing teaching center and every effort is made to make use of the opportunities offered by the hospital in instruction and orientation.

Students are admitted under two general plans. Both groups must meet the specific requirements in preparatory courses. 1) Graduates of accredited colleges and universities with the required units are admitted for the 14 months' course. 2) Those who have not received a degree previously, must have at least three years of college work fulfilling the basic degree requirements, including residence, of an accredited college or university which gives credit for the final 30 units as earned in the physical therapy course.

A three year preparatory course is provided at U.C.L.A for this purpose and students from that university receive their degrees at the next commencement following the completion of the physical therapy course.

Los Angeles provides more than ample facilities for clinical training, including two large veterans' hospitals, the California State Cerebral Palsy Centers, (Childrens Hospital is a diagnostic center), numerous private hospitals, and an outstanding contagious disease unit and convalescent hospital for poliomyelitis patients.

Cerebral Palsy Workshop at Stanford University

The Division of Physical Therapy, Stanford University, will present a six-day program on the treatment of cerebral palsy. The form of the program will be primarily panel discussion. The sections and staff are as follows:

Phases of Child Development and Motivation Technics

Dr. Edith Dowley, Department of Psychology, Stan-

ford University (Director of the Nursery School, Stanford Village)
Dr. Alvis Scull, Department of Pediatrics (School of Medicine), Stanford University
E. A. Lown, State School for Cerebral Palsied Children, Redwood City, California

Speech Reeducation Related to Physical Therapy and Occupational Therapy
Dr. Virgil Anderson and Staff, Speech and Hearing Clinic, Stanford University
Mrs. Dorothy Johnson, State School for Cerebral Palsied Children, Redwood City, California

Physical Evaluation by the Physician
Dr. S. Malvern Dorinson, Mt. Zion Hospital, San Francisco

Physical Evaluation by Functional Testing

Correlation of School and Home Therapy Technics

Normal Gait and Gait Training for the Cerebral Palsied Child

Development of Equipment Used in Care of the Cerebral Palsied Child
Robertine St. James, Moody State School for Cerebral Palsied Children, Galveston, Texas
Martha Norris, Cerebral Palsy Mobile Unit of the California Elks Association
Mrs. Edith Whitaker, State School for Cerebral Palsied Children, Redwood City, California
Sarah Semans and Marian Williams, Division of Physical Therapy, Stanford University

Selected Technics Used in the Treatment of Cerebral Palsy (Including Laboratory Practice)
Margaret Knott and Dorothy Voss, Kabat-Kaiser Institute, Vallejo, California

The course is open to physical therapists and occupational therapists qualified in their respective fields. All requests for further information and application forms should be sent to the Division of Physical Therapy, Stanford University (Bldg. 101), Stanford, California.

Mobile Therapy Unit in Philadelphia

The Beneficial Saving Fund Society of Philadelphia recently presented a completely equipped home treatment unit to the Eastern Pennsylvania Chapter of the Arthritis and Rheumatism Foundation.

The unit includes many pieces of therapeutic equipment along with a portable treatment table and will be transported in a specially built truck. It is to be operated by the Visiting Nurse Society of Philadelphia and home treatments administered by their staff physical therapists.

Index to Current Literature

An Assistive Device to Develop the Pectoralis Major and Biceps Brachii Muscles in Post-Operative Cineplasty. John J. Keys, Ortho. & Prosthetic Appliance J., 7:21-26, March 1953.

Television in Health Education. W. W. Bauer, J. Health, P. E., Recreation, 24:8-10, March 1953.

Special Psychiatric Problems of the Paraplegic, Report of a Case of Attempted Suicide by a Paraplegic. J. Petrus, A. B. Balaban. Am. J. Psychiat., 109:693-695, March 1953.

Physical Rehabilitation of a Hemipelvectomy Amputee. Odon F. von Werssowetz and Cecil W. Painter, Ann. Surg., 137:395-398, March 1953.

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Our Book Reviewers for July

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Ruth Whittemore, Professional Services, National Office, American Physical Therapy Association.

Abstracts

Evaluation of Red Cross Gamma Globulin as a Prophylactic Agent for Poliomyelitis

1. Plan of Controlled Field Tests and Results of 1951 Pilot Study in Utah. William McD. Hammon, M.D., Dr. P.H., Lewis L. Coriell, M.D., Ph.D., and Joseph Stokes Jr., M.D., J.A.M.A., 150:739-749, October 25, 1952.

The principal purpose of this study was to determine whether the administration of reasonable amounts of gamma globulin given before the onset of illness would protect a person against the paralytic manifestations of poliomyelitis. Other purposes which it hoped this study would reveal concerned the duration of protection and the development of inapparent infection, with subsequent active immunity.

Gamma globulin was selected as the most suitable form of antibody as it had been used safely and extensively as a measles prophylaxis. Red Cross gamma globulin was selected because it possessed equal titers of antibodies against the three known types of virus.

A special committee of nationally recognized scientists and a group of advisors from several national medical and public health organizations approved the proposed plan. By a method of random selection half of the children would receive injections of gamma globulin and the other half would receive injections of an inert gelatin solution. The records would not be available to the investigators until after a follow-up period of time necessary to establish a final diagnosis. To insure statistically significant results, participation of 50,000 children would be necessary.

Utah was selected as the site of the pilot study during which 5,767 children received injections. A small metropolitan community was chosen where a severe epidemic was in progress, and the cooperation and participation of the public was phenomenal. The study was carried out as planned and there were no significant clinical reactions observed and no evidence that the inoculations led to any increase or localization of paralysis.

As anticipated, the injected group was too small to determine whether gamma globulin afforded any protection against poliomyelitis. In order to obtain significant results a much larger scale plan was set up for 1952.

Evaluation of Red Cross Gamma Globulin as a Prophylactic Agent for Poliomyelitis

2. Conduct and Early Follow-up of 1952 Texas and Iowa-Nebraska Studies. William McD. Hammon, M.D., Dr. P.H., Lewis L. Coriell, M.D., Ph.D., and Joseph Stokes Jr., M.D., J.A.M.A., 150:750-756, October 25, 1952

The results of the 1951 pilot study conducted in Utah, testing the effectiveness of the use of gamma globulin as a prophylactic agent for poliomyelitis, warranted further study. The areas selected for the 1952 study were Harris County, Texas, where 33,137 children between the ages of 1 and 6 years were inoculated and Woodbury County, Iowa, and the adjacent Dakota County, Nebraska, where 15,686 children between the ages 2 to 11 years were inoculated. Except for minor modifications the plans of the test remained the same so that results obtained from all of the studies could be combined for analysis. Again excellent participation and cooperation were received from the medical profession and the public.

No conclusions have been drawn as the follow-up studies are still in progress. To date 85 paralytic cases have been reported with more cases expected to occur. Thus, as anticipated, the number of children inoculated has yielded enough cases to provide results which will be highly significant.

Evaluation of Red Cross Gamma Globulin as a Prophylactic Agent for Poliomyelitis

3. Preliminary Report of Results Based on Clinical Diagnoses. William McD. Hammon, M.D., Dr. P. H., Lewis L. Coriell, M.D., Ph.D., and Joseph Stokes Jr., M.D. J.A.M.A. 150:457-160,October 25, 1952.

A preliminary tabulation of the results of the series of three controlled field tests conducted to evaluate the prophylactic effect of gamma globulin in poliomyelitis was made October 1, 1952. Inoculation of 54,772 children between the ages of 1 and 11 years was conducted, one-half receiving gamma globulin and one-half receiving a solution of gelatin. Ninety cases of paralytic poliomyelitis were diagnosed in this study group. Analysis of these patients on the basis of the type of injection received shows that significant protection was conferred by the gamma globulin.

During the first week after injection there was no significant reduction in the number of cases in the group receiving gamma globulin, but the severity of paralysis appears to have been modified. From the second through the fifth weeks highly significant protection was demonstrated. After the fifth week this was less evident, but after a longer follow-up period more definite conclusions regarding the duration of protection and possible modification of disease should be reached.

Information regarding the effect of inapparent infection and the subsequent development of active immunity should be available after the completion of laboratory studies.

Evaluation of Red Cross Gamma Globulin as a Prophylactic Agent for Poliomyelitis

4. Final Report of Results based on Clinical Diagnosis. William McD. Hammon, M.D., Dr. P. H., Lewis L. Coriell, M.D., Ph.D., Paul F. Wehrle, M.D., and Joseph Stokes, Jr, M.D., J.A.M.A., 151:1272-1285, April 11, 1953

In this report are presented the final tabulations and anlayses of clinically diagnosed cases of paralytic poliomyelitis that occurred in the children who received either gamma globulin or gelatin in the three communities studied. Also, children of the same age group who did not receive injections have been considered as a third group for purposes of comparison.

Repeated careful examinations following the acute febrile phase of the disease were made by selected physicians and physical therapists to detect and measure the degree of any paralysis. A diagnosis of paralytic poliomyelitis was made only in cases in which there were a characteristic history and physical findings together with definite weakness of one or more muscles and with the absence of pain, muscle spasm, or other cause to explain it.

A diagnosis of nonparalytic polio-

myelitis was made only in the presence of positive cerebrospinal fluid findings, associated with a typical history and clinical manifestations.

Red Cross gamma globulin in an average dose fo 0.14 cc. per pound of body weight in controlled field tests in three epidemic areas was shown to give highly significant protection against paralytic poliomyelitis. Cases occurring during the first week following the injection of gamma globulin were significantly modified in severity. During the next period of four weeks a high but not complete degree of protection was demonstrated. During the sixth to the eighth week after injection the protection appeared to be waning, and none was detectable after the eighth week.

To substantiate the validity of the controls, data were examined to determine whether there was any evidence to suggest that inoculations of gelatin had localized or provoked paralysis; no such evidence was found.

As gamma globulin is the only agent that has been demonstrated to be safe and effective in the prevention of poliomyelitis, recommendations are offered regarding doses and methods of administration. The current limitation of supply of gamma globulin will require a plan for its distribution to communities.

Studies in Human Subjects on Active Immunization against Poliomyelitis

1. A Preliminary Report of Experiments in Progress. Jonas E. Salk, M.D. (with the collaboration of Major Byron E. Bennett, U.S. Army Ret.), L. James Lewis, Ph.D., Eloise N. Ward, M.A., and J. S. Younger, Sc.D.), J.A.M.A., 151:1081-1098, March 28, 1953.

In order to produce an effective vaccine, investigations have been under way to find a means of destroying the disease producing properties of the poliomyelitis virus, without destroying completely the capacity to induce antibody formation.

The rather recent finding that all poliomyelitis virus can now be typed for immunological study as one of three strains, Brunhilde, Lansing or Leon, and the discovery that the virus can be propagated in non-neural tissue cultures have been very important. The latter technic has made it possible to make quantitative estimations of the antibodies of all three types.

The virus for the three strains which furnished the vaccine for this study was obtained from monkey tissues. Infectivity was destroyed by treatment with formaldehyde, and then in some experiments, antigenic activity increased by emulsification with mineral oil. The materials and methods used in preparation are minutely described.

The safety of the vaccine for use in human studies was first tested by intracranial innoculation in monkeys. Tests for antibodies in the human serum samples were made before and after the vaccination, to detect the presence of any one of the three types.

Vaccination studies were made on 98 children in one home and 63 at another. A number of these children had recovered from recent paralytic poliomyelitis, the rest had various other disease diagnoses without a history of poliomyelitis.

Three projects were carried out. The earliest experiments with 51 children were by intradermal innoculation of an aqueous vaccine. This study showed only *type two* to be effective in production of antibodies when so administered. Twenty-seven children were innoculated intramuscularly with an emulsified vaccine. Later experiments to test the possibilities of incorporating all three types in an emulsified vaccine to be given intramuscularly were made with 63 children. Time has not permitted conclusive results to be obtained, but evidence is encouraging that this form will be effective.

The antibody level produced by innoculation has remained and it appears that much smaller amounts of material than was originally supposed can produce satisfactory antibody levels.

Attention is called to the many instances of incomplete data, due to lack of time, numbers, or other contributing factors, and conclusions are given to show trends and further avenues of study.

As a result of the preliminary studies in human subjects the following conclusions are drawn: that antibodies for all three immunological types of virus have been produced by emulsified vaccine innoculations; that antibody formation for *type two* has been induced by aqueous innoculations; that antibodies produced have been maintained for four and a half months; that the level of antibodies induced by vaccination is believed to be comparable with levels developed after natural infection; and that available data suggest the possibility of a noninfectious preparation approximating immunity, although this should not be interpreted that a practical vaccine is now at hand.

Home Care of Patients with Acute Poliomyelitis

Philip M. Stimson, M.D., J.A.M.A., 149:719-725, June 21, 1952.

In many instances, it has been found advantageous to keep poliomyelitis patients at home instead of sending them to the hospital immediately, as formerly has been the practice.

It saves the patient unnecessary fatigue, which has proved an aggravation with oncoming disease. Parents prefer to keep the child at home if assured that care will be adequate, as it lessens emotional disturbances, decreases the financial burden, and does not jeopardize other members of the family since they have already been exposed to the disease. This plan releases more hospital beds for seriously ill patients, and the family physician can remain in close touch with the patient.

Three types of patients to be considered for home care are: patients, especially siblings of an already diagnosed polio patient, with "characteristic minor illness"; patients with a diagnosis of polio, but without any paralysis as yet; selected patients whose slight weakness does not threaten life.

Diagnosis, even to a lumbar puncture, can be made at home. In some communities, consultation is given by a locally appointed team. It is noted that adequate facilities as well as attending personnel must be available in the home.

Indications for sending a patient to the hospital include increasing elevation of temperature, evidence of bulbar symptoms, and evidences of irritation in the vasomotor centers.

Home care for the child need not be complicated. Isolation of the patient to the room should be adhered to and the attendant should be careful to wash his hands before going elsewhere. Any siblings in the family should be removed from school for two weeks and remain away from crowds during this period.

A mattress and a footboard should be used on the bed, but a bed board is not often necessary. Quiet should be maintained and rest encouraged, but sedation is avoided. Moist heat may be provided by hot tub two to four times a day for five to fifteen minutes with temperature starting at

body heat and increasing to 102°F. If tubs are impractical, hot moist packs may be applied to the back, neck, thigh, calves and feet for ten minutes. This is done three or four times in the twenty-four hours. Passive motion to each joint within the range of pain should follow the hot pack.

Difficulties in elimination may be surmounted by allowing the patient to sit up supported, or even to use a bedside commode. Enemas are suggested rather than the use of cathartics.

When the patient is afebrile, a complete muscle test should be done. If there is no paralysis, a program of gradually progressive activity is planned to cover the five weeks from onset. If there is paralysis, plans should be made with the health organization to cover consultation services, nursing care, and physical therapy or even visits to an outpatient clinic.

Often a community education program is necessary before neighbors will accept a home care program, but it has proved its worth in the satisfaction of the parents and patients, in the saving in hospitalization, and in unnecessary exposure of the patient to the fatigue of travel.

Present Additions to Knowledge of Poliomyelitis

H. W. Kumm, M.D., J.A.M.A., 150: 1179-1182, November 22, 1952.

A review is presented of advancement in five fields of the study of poliomyelitis.

1. Etiology. Recent investigations have found all presently known poliomyelitis virus can be separated into three antigenic groups. Of 100 different viruses, 85 were classified as Group I (Brunhilde), 12 as Group II (Lansing), and 3 as Group III (Leon). It also has been found that more than one strain of virus may be found in an epidemic, and that immunity to one strain does not prevent a patient from a second attack of poliomyelitis by a different group.
2. Pathogenesis: A period of verimia has been discovered in primates giving rise to the belief that invasion of poliomyelitis virus is by way of the mouth and is spread from the gastrointestinal tract through the lymphatic system to the blood stream.
3. Factors precipitating paralysis: Activity during the first stage has no effect but during the febrile period it increases the incidence and severity of subsequent paralysis. The incidence of poliomyelitis in patients having recent tonsillectomy is three times greater and in those patients the bulbar type of the disease is 11 times greater. The attack rate in pregnant women is 74 as compared with 47 per 100,000 in nonpregnant women. Injections cause no greater poliomyelitis incidence, but injections for diphtheria, whooping cough and tetanus have been known to localize the area of paralysis.
4. Immunization Studies: It has been found that antibodies may be developed in monkeys by feeding them poliomyelitis virus. Since no vaccine is available, passive immunization by use of gamma globulin is being experimented with.
5. Tissue Cultures: Recently it has been found possible to cultivate all three poliomyelitis virus strains on monkey or human tissue in test tubes. This makes possible the isolation and identification of virus strains from patients without sacrificing animals. It may show also a rise or fall in the patient's antibody level. It is not yet know if it will be possible to produce a nonpathogenic strain capable of retaining its antigenicity.

Priscoline in Acute Poliomyelitis: Clinical Observation of Seventy-one Patients

A. C. LaBoccetta, M.D. and K. E. Davison, M.D., J.A.M.A., 148:1083-1085, March 29, 1952.

Pain occurs in the majority of acute anterior poliomyelitis patients for a duration of two to six weeks, although sometimes it lasts six to nine months. Observation has been made that pain and spasm of the muscles are the result of ischemia from angiospasm and can be relieved by increasing the blood supply to the muscles with external heat or vasodilator drugs.

An experiment was made in the Philadelphia Hospital for Contagious Diseases in 1950 on 71 patients, all of whom had marked symptoms of pain and muscle spasm. No control group was used. The purpose was to find a quicker relief for pain and a desirable substitute for hot packs.

Priscoline was given preferably intramuscularly every four hours to 71 patients ranging from four to 34 years of age. The dosage depended on the age of the patient and the response obtained; the drug was given until symptoms disappeared.

A full relief of pain and practically full relief of spasm was obtained in 27 per cent of the patients; full relief of pain and partial relief of spasm in 37 per cent; and no benefit was obtained in 37 per cent. Definite relief was observed in 15 to 20 minutes if the response was good.

Untoward reactions were observed in 24 per cent of the patients. This consisted of nausea, vomiting and gastrointestinal disturbances. In some patients marked flushing of the skin, diaphoresis, and urticaria, was observed.

In summary, it was felt that a trial with priscoline for the relief of spasm and muscle pain would be justified.

Poliomyelitis. VIII. Studies on Temperature Regulation

I. A. Brown, A. B. Baker, and S. Cornwell. ARCH. NEUROL. AND PSYCHIAT., 69:332, March, 1953.

A study of 115 bulbar poliomyelitis cases was made in an attempt to shed further light on the role of the hypothalamus in temperature regulation. These cases were followed clinically and pathologically in order to determine what cell groups in the hypothalamic area were concerned with body temperature regulation. Patients with hyperthermia out of proportion to the severity of the illness, and which comprised the predominant symptom with no secondary infection to account for it, composed the majority of subjects.

In such cases the supraoptic, paraventricular, and lateral nuclei of the rostral hypothalamus were particularly involved, showing intense inflammatory processes. It would, therefore, appear that these three nuclear groups play a role in the reduction of body temperature. Histological studies showed that in 12 cases without hyperthermia there was severe damage to the supraoptic nucleus, indicating that this cell group has little to do with the regulation of body temperature. The same was found true for the lateral nucleus, thus leaving the paraventricular group to be exclusively associated

with maintaining a normal lowering of the body temperature. Since all these groups are situated in the anterior hypothalamus, it is concluded that the anterior hypothalamus is active in reducing body temperature and that its injury will be followed by hyperthermia.

Cases of relative hypothermia studied reveal principal involvement of the lateral and medial nuclei. The former, also involved with hyperthermia, plays no specific role in hypothermia but nevertheless must be considered an important mechanism in the control of body temperature. The medial cell group was considered to be the specific site in control of elevation of body temperature, its damage resulting in hypothermia.

Damage to the hypothalamus, a frequent involvement of bulbar poliomyelitis, often causes instability of temperature control which complicates care of these acutely ill patients.

One Health Unit Fights Polio

Lucille Sawyer and Louise Guidry, NURSING OUTLOOK, 1:1, January 1953.

The experience of a community in combating polio demonstrates the value of early preparation and group planning before the epidemic has occurred.

With a noticeable increase in the number of polio patients in June, 1951, the Caddo-Shreveport Health Unit in Northwestern Louisiana reviewed existing policies and established new ones in preparation for a possible emergency. Hospital facilities in the area were surveyed with the result that the Veterans Administration offered facilities for a polio unit. Consultants of the Joint Orthopedic Nursing Advisory Service helped to set up the new unit at the Veterans Hospital and gave three Institutes for 120 nurses and 60 volunteer workers. Local nurses were employed at the emergency unit and many other nurses volunteered their services on both isolation and convalescent wards. Special equipment was furnished by the National Foundation for Infantile Paralysis. A local polio planning committee was organized with representatives from professional and civic groups.

The generalized public health nursing staff of the local Health Department was able to meet the needs of some of the polio patients in the area during the epidemic by curtailing the regular Health Department activities. Well Baby, Child Health, and Maternity Clinics were reduced to a minimum.

Recognizing the inadequacy of available services of public health nurses and physical therapists, the local and state health officials evaluated the needs and then consulted with personnel from the Joint Orthopedic Nursing Advisory Service, the American Physical Therapy Association, and the Children's Bureau of the Federal Security Agency. Application was made to the National Foundation for Infantile Paralysis for an epidemic aid grant for a period of three months, which was later extended six months, to secure three additional public health nurses and one more physical therapist. The funds were distributed by the chief of the section for Crippled Children Services of the Louisiana State Department of Health and the director of the Division of Public Health Nursing.

The emergency nurses were assigned to local health units and given the responsibility for a district, making possible better management and more effective service in each district. A physical therapist recruited through the American Physical Therapy Association to the State Department of Health for temporary aid set up treatment centers in local health units. Appointments were made for the patient and his family to meet the physical therapist at the treatment center for instructions in care which was to be continued at home.

Polio records were kept in one large file, making them more accessible to research personnel. A tickler card system was used for follow-up. Spot maps were made of the cases in the different areas, and graphs of the incidents, ages, sex, and color were compiled by the clerical section.

When the patient was to be discharged, hospital personnel set up a routine procedure, which included demonstration of recommended exercises to the parents by the physical therapist, and instruction by the nurse in bed positioning, supportive measures, and special diets if indicated. The social service worker was responsible for sending the discharge notice to the secretary of the section of Crippled Children's Services and to the Health Unit.

Health Department personnel provided follow-up services for the patient. On the nurse's initial visit to the home of the polio patient, she had made an evaluation of the home for convalescent care. Upon receipt of referral, the nurse visited the patient as soon as possible to interpret the physician's orders, to follow through on the hospital's recommendations, and to refer the patients to other community agencies for assistance. She observed the physical therapist demonstrate exercises to the patients' families for better understanding. Frequent conferences regarding the patient's progress were held by the physical therapist, the orthopedic nursing supervisor, and the nurses.

Subcommittees of the State Polio Planning Committee are continuing to function on housing and foster home care for children needing close supervision by the public health nurse and the physical therapist. Professional and lay groups are continuing their interest by requesting additional educational programs.

The experience of this community in handling acute and convalescent polio has resulted in closer working relationships with all groups concerned and in continued planning for the future.

The Significance of Poliomyelitis During Pregnancy. An Analysis of the Literature and Presentation of Twenty-Four New Cases

Victor M. Bowers, Jr., and D. N. Danforth, AM. J. OBST. & GYNEC. 65: 34-39, January, 1953.

Acute anterior poliomyelitis complicated by pregnancy has assumed an increasing prominence in the medical literature, with 586 verified cases reported to date. The variance of conclusions in previous studies based on small groups of cases has prompted the authors to make a collective analysis of all reported cases and to add details of 24 new cases observed.

Of the reported cases, 404 present sufficient evidence to allow correlation. The distribution of poliomyelitis according to trimester of pregnancy is even. Approximately two-thirds of the cases fall in the age group 20 to 29 years. Three-fourths of the cases occur in first or second pregnancies. The polio death rate among the 428 cases of poliomyelitis complicated by pregnancy was 9.7 per cent, a figure statistically higher than the death rate in the nonpregnant group. Of significance too, more than one-half the maternal deaths occurred during the last trimester and in the immediate puerperium.

with the period immediately following delivery the most critical time.

The occurrence of residual paralysis appears not to be influenced by pregnancy, the incidence being of the order of 50 per cent in both pregnant and nonpregnant groups. Thus, although the possibility of death from polio is higher when the disease is contracted during pregnancy, if the patient survives, her chance of residual paralysis appears no greater than if she were not pregnant.

Poliomyelitis appears to have little if any effect upon uterine activity, nor does it cause any undue obstetrical hazard in the absence of respiratory embarrassment. In the presence of respiratory difficulties prompt tracheotomy is advocated, and after the thirty-second week caesarian section may be a life-saving procedure.

Pregnancy wastage occurred in one-third of the twenty-four new cases observed, including spontaneous abortion, stillbirths or neonatal death. Although no fetal defects occurred, data is presented suggesting that when polio is acquired during the first or second trimester of pregnancy, the babies delivered at term may show significant retardation in general development and birth weight.

Tracheotomy in Bulbar Poliomyelitis

Orel Friedman, M.D., and Joseph C. Gilbert, M.D., THE LARYNGOSCOPE, LXII: 1112-1120, October 1952.

During 1949-1950 the Kingston Avenue Hospital admitted 1,237 poliomyelitis patients. Of these, 203 had bulbar or bulbar-spinal involvement and all of the resulting 89 deaths occurred in this group.

Tracheotomies were performed on six patients with the survival of only one. This represented a survival rate of 16.6 per cent which was lower than the over-all survival rate of patients with bulbar involvement. This figure merely indicates that the more desperately ill are operated upon and a fair percentage of those who survive owe their lives to tracheotomy. The experience of others in the field is similar and bears out this hypothesis.

The authors believe that tracheotomy may be a life-saving procedure in bulbar poliomyelitis and is indicated in the presence of bilateral vocal cord paralysis or when secretions are obstructing the airway, especially when associated with unilateral vocal cord paralysis or spasm of the larynx. They feel that it is preferable to perform the operation before there is evidence of medullary center involvement, but involvement of the medullary centers with respiratory and circulatory failure may follow even with a well-functioning tracheotomy.

Epidemiology of Poliomyelitis

F. H. Top, M.D., J. IOWA STATE MED. SOC., 138, April, 1953

The infectious agent of poliomyelitis seems to be one of the smallest filterable pathogenic viruses known to man. Three immunologically distinct types are known, 1) Brunhilde, 2) Lansing, and 3) Leon. Each is world wide in distribution and each has several strains.

Epidemic poliomyelitis was thought at first to be confined to temperate climates but it is now known to be more widespread as evidenced by reports of epidemics from both tropic and frigid zones, though these are both small and infrequent. Polio can occur at any time of the year but is more prevalent from late spring to early fall. The peak usually occurs in late summer and roughly half of the cases occur by the time the peak is reached.

The worst epidemic recorded (including all age groups) involved between 1 and 3 persons per 1,000 population. Moderate to severe outbreaks involve about 1 per 10,000 and mild seasons range between 1 and 3 per 100,000. The severe epidemics do not occur in the same community in successive years and are more likely to occur in larger communities every three to seven years.

Polio infection is as widespread as measles and is an infection common to most people. The ratio of recognized cases to unrecognized ones has been estimated at 100:1. The disease used to have its highest incidence in the age group under ten, but since 1945 a decided shift to older age groups has been noted, and the proportion of paralytic cases over 14 years has increased. People in rural communities are stricken at later ages indicating that exposure to the infection is postponed longer in rural communities. Males are affected more than females, the ratio ranging usually from 3:2 to 5:4. The Negro was thought to be less susceptible but recent studies in urban areas claim this is dependent upon vagaries of chance in relation to areas most heavily affected.

Man is the only known reservoir of infection. The virus has been recovered from the pharynx from 5 days before to 14 days after the first sign of illness; it has been recovered in the stools as long as 19 days before to 100 days after the so-called abortive illness. It is possible that the pharyngeal secretions are the most likely source of contact infections while the feces are the source of noncontact and subclinical infections. The transmission is primarily by contact with infected persons. There is no evidence of other carriers. The portal of entry is almost certainly the mouth, but the pathway from here is a problem for inquiry. As far as can be determined, most individuals are susceptible to polio as soon as they are in contact with the virus but for the majority this means a subclinical infection.

At present, no adequate answer can be given to the problem as to why paralysis occurs in so few persons. The factors of stress, fatigue, dietary deficiencies, preceding illnesses, and operations on the nasopharynx all have been connected with more severe cases, but further study of the physiologic factors that condition the host remains a challenge for the future.

Results of Kenny Treatment of Acute Poliomyelitis

Miland E. Knapp, Lewis Sher, and Theodore S. Smith, (J.A.M.A.) 151: 117-120, January 10, 1953.

Arrangements were made in 1940 to attempt an evaluation of the Kenny treatment of poliomyelitis at the Minneapolis General Hospital. The present study covers a follow-up period ranging from 5 to 10 years in which the patients studied were treated by Miss Kenny or by therapists under her supervision and during the acute stage of the disease. The treatment consisted essentially of (1) methods of overcoming "spasm"; (2) muscle reeducation stressing coordination rather than strength; (3) avoidance of immobilization wherever possible, and (4) avoidance of braces or other supports except where necessary.

Only patients admitted within four weeks after onset of the disease were included in this study. A questionaire form was sent to patients who were unable to come in for exam-

ination. This form contained a check-list of questions ascertaining the status of the patient at the time and from the information obtained from the forms, the patients were classified into four groups: (1) completely normal; (2) essentially normal; (3) moderately weak; and (4) severely disabled, with the criteria for each group clearly defined.

Four hundred and seventy-eight patients were admitted within the four-week period of onset of the disease and of this number 391 replied to the questionnaire or were examined. This represented about 82 per cent of the total cases seen. This figure was actually reduced to about 346 as there were deaths and other circumstances which reduced the number of cases used in the study.

A breakdown of the results showed that 239 or 69 per cent of the patients were normal or essentially normal; 78 or 23 per cent were moderately weak; and 29 or 8 per cent were classified as severely disabled.

A study of the results seemed to indicate that the need for surgical intervention and progression of scoliosis was greater as the interval of time between onset of the disease and beginning of treatment was greater. Thus, the earlier treatment was started, the less was the necessity for surgery and the incidence of scoliosis.

Names Added to Abstractors for July

Eleanor M. Anderson
Helen J. Hislop
Dorothy Mandragos
Thelma Pedersen
Helen V. Skowlund
Ruth Whittemore

Book Reviews . . . . .

Poliomyelitis — Papers and Discussions Presented at the Second International Poliomyelitis Conference. *Compiled and edited for the International Poliomyelitis Congress. Cloth; price $7.50. Pp. 555; illustrated. J. B. Lippincott Co., Philadelphia, Pa. 1952.*

This book is a compilation of all the papers and discussions given at the Second International Poliomyelitis Conference which was held in Copenhagen, Denmark, in 1951. Progress in the knowledge and understanding of the disease, which has been made throughout the world since the first international meeting in New York in 1948, was reported by outstanding specialists in their respective fields. Thirty-six countries participated. These papers cover such subjects as the advances made in the studies of the poliomyelitis virus, the pathology and pathophysiology of the disease and its treatment, and include the surgical and physical rehabilitation of the patient as well as the social and psychological aspects. Papers on the immunity and resistance of the virus and the ecology of poliomyelitis brought the session to a close. The last third of the book is given over to the reports of the scientific exhibits which were presented.

The book is printed on fine quality paper, providing easy reading, as well as assuring excellent reproduction of the large number of photographs, charts and tables which accompany the articles.

While much of the material presented is not new to a professional person, who has followed the reports on poliomyelitis through recent years, it will be found that the papers are clearly and understandably presented. The collection of all this material pertaining to poliomyelitis makes a valuable source book. Students interested in various phases of the subject will find the wealth of references extremely helpful. Dr. Morris Fishbein in the preface mentions that the first volume of this series, containing the material presented at the 1948 meeting, is now "available in practically all the medical libraries of the world," and it is anticipated that this volume will receive greater circulation.

The increasing interest in the subject of poliomyelitis was attested by greater number of participants attending the meeting in Denmark, as well as by the large number of universities and research centers which contributed to the program.

Sponsors of the conference, the Danish National Foundation for Infantile Paralysis and the National Foundation for Infantile Paralysis, U.S.A., were represented by Dr. Niles Bohr and Mr. Basil O'Connor, who opened the discussions. The dedication of this book and the tone of the whole meeting was provided by Mr. O'Connor's closing remarks — "Together we will conquer poliomyelitis."

Orthopaedic Appliances Atlas, Volume I. *By the American Academy of Orthopaedic Surgeons in Cooperation with Office of the Surgeon General, U.S.A., and the Veterans Administration Department of Medicine and Surgery. Cloth; price $10. Pp. 588; illus. 945. Edward Bros., Inc., Ann Arbor, Mich., 1952.*

This volume contains a review and an analysis of the supportive aids employed in the practice of orthopaedic surgery, "the purpose of which is to familiarize orthotists, brace makers, residents and orthopaedic surgeons with the development of the standards and technical production of individual orthopaedic appliances."

Dr. Paul B. Magnusen states in the preface that the atlas is an attempt to clarify terminology and technics of brace making as a means of providing a common language for understanding between the physicians and the brace makers.

Part I, a brief history with illustrations, compliments the early pioneers in brace making.

Part II considers the materials used in bracing, their preparation and uses, and explains their adaptability for special needs. Every step in the preparation of leather, steel, aluminum, rubber, plastic, adhesives, plaster of Paris, fabrics and wood, necessary in the production of the brace, is explained.

Parts III, IV and V deal with braces used for the spine and trunk, upper extremities, and lower extremities which include foot appliances and shoe alterations. Each section contains a brief history, anatomical and physiological discussion, definitions of deformities, adaptability of materials and methods of brace construction with numerous illustrations, and is supplemented by generous bibliographies.

Part VI is divided into three sections which consider paralytic bracing for poliomyelitis, paraplegic, and cerebral palsy patients. Special consideration is given to these three classes, since in them bracing may be necessary over a long period of time.

In poliomyelitis the basic brace requirements for supportive, assistive, and corrective needs are considered

by Dr. C. E. Irwin, who covers the subject of lower extremity, back and upper extremity apparatus thoroughly. Dr. L. T. Peterson deserves the credit for the section on paraplegic bracing, and Dr. W. M. Phelps has written the section on braces for cerebral palsy patients.

In the final part, measurements for bracing are considered in detail. Recently the government services have adopted a uniform method of measuring joint motion in an attempt to clear up previous existing confusion. This standard form is printed and discussed with illustrations, together with methods of measuring other parts of the body.

The book is a valuable source of information to the physical therapist.

Handbook of Orthopaedic Surgery. *By Alfred Rives Sands, Jr., M.D., Medical Director of the Alfred I. duPont Institute of the Nemours Foundation, Wilmington, Dela. In collaboration with Richard Beverly Raney, M.D., Professor of Surgery in Orthopaedic Surgery, University of North Carolina, Chapel Hill. Fourth Edition. Cloth binding; price $8.00. Pp. 644; illus. 192. C. V. Mosby Co., St. Louis, Mo., 1952.*

This book is a textbook for medical students and is also written for the general practitioner. The fundamental principles of orthopaedic surgery are given concisely and yet in sufficient detail to convey adequate knowledge of the subject.

The author's purpose is to give the consensus of orthopaedic surgeons rather than one man's point of view. The author has had great experience in military service as well as in private practice. He had asked for the criticism of twenty-four experienced teachers of orthopaedic surgery and allied subjects from eighteen different medical schools. Each chapter was reviewed by more than one authority.

Twenty-four chapters cover the orthopaedic subject matter as generally taught in medical schools.

The format adapts itself well as a textbook for the medical student. The book is of good size and of excellent paper and print. Illustrations are uniform and the x-ray findings are shown by reproductions. A well-selected bibliography is appended.

This is the fourth edition of this successful book, and there is improvement in its format.

Manual of Procedures of the Children's Division. *By George G. Deaver, M.D., and Staff in collaboration with the Association for the Aid of Crippled Children, New York City.* Rehabilitation Monograph IV. *Paper; price $1.00. Pp. 43. Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, New York, 1952.*

This monograph is the fourth in a series of five published and distributed by The Institute of Physical Medicine and Rehabilitation. Unlike the other publications this is an operating manual which outlines the objectives, philosophy, policies, and functions of the staff of the Children's Division of the Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center. It is interesting to note that this Second Edition of the manual was developed from functional analysis of each position and other studies after the Children's Division had been operating for a sufficient length of time for a pattern to have been established.

The purpose of developing such a manual is primarily for the use of the Institute's own staff in orientation, guidance and instruction. The secondary purpose is for the use of others interested in the organization and administration of similar units. No claim is made that the policies, procedures, and functions of the various staff members are ideal. The only claim made is that this manual does reflect the organization and administration of this particular unit as it is functioning at the present time.

Over half of the manual is devoted to job descriptions of the various members of the staff. Unfortunately the job descriptions do not differentiate between full-time and part-time staff, nor do they give the minimum qualifications necessary for each position. The two key positions are the Medical Director and the Administrative Coordinator. The functions of the latter encompass not only administrative duties but extend into education and technical supervision of the physical and occupational therapists. This pattern of combined technical and administrative duties in small units is not unusual. Whether or not this is the most efficient use of professionally trained personnel is questionable.

The delineation of functions of other staff members is interesting and different from other units serving children. Especially is this true in the area of psychosocial functions and parent interviews.

All organizations should have an operating manual which is available to all staff members in order to guide them in their daily activities and long-range planning. Many difficulties could be avoided if the aims, philosophy, policies, procedures and functions were in writing before treatment units were developed. Dr. Deaver, the staff of the Children's Unit, and the Association for the Aid of Crippled Children are to be congratulated on developing this manual, and making it available to interested persons. It should be of value to anyone interested in the administration of children's rehabilitation centers, bearing in mind that an operating manual developed for one unit cannot be used by another unit without modifications and changes to meet its aims and needs.

Diagnostic Manual in Speech Correction. A Professional Training Workbook. *By Wendell Johnson, Ph.D., Professor and Chairman of the Council on Speech Pathology and Audiology, University of Iowa; Frederic L. Darley, Ph.D., Assistant Professor of Speech Pathology and Audiology, University of Iowa; and D. C. Spriestersbach, Ph.D., Associate Professor of Speech Pathology and Audiology, University of Iowa. Paper binding; price $2.50. Pp. 222. Harper & Brothers, New York, 1952.*

The subtitle of this book indicates its design, but is limited as a statement of purpose. While its primary purpose is to provide a student training workbook of methods of examining and diagnosing speech disorders, the manual also has the very important purpose of further clarifying and standardizing diagnostic procedures in speech correction. It is unique in that no other book of its kind has been published to date.

The authors' statement in the foreword indicates that the manual was intended to be used as supplementary material to textbooks; however, in some respects its contents qualify it as a brief text.

The manual contains twenty-two units plus an appendix of ten sections. Each unit includes an assignment, procedure instructions, and forms to be used in the examination. Each assignment is preceded by a brief but excellent discussion of background information. The discussion includes a description of the problem, particular aspects and principles underlying the area with which

the unit is concerned, summarizations of major research findings, and, in some units, etiological and developmental factors. The explanatory material accurately represents current knowledge in the various fields discussed. The units range from the procedures of the case history interview through eighteen units of basic testing and observational methods, to the preparation of the examination report. Examination and diagnostic materail is provided for cases of functional voice and articulation disorders, retarded speech development, and stuttering. There are no units dealing directly with the problems of cleft palate, cerebral palsy, post laryngectomy speech, aphasia, organic voice disorders, or the speech of the hard of hearing, as the authors consider the procedures included in the units to be basic to speech examination and diagnosis for these cases, also.

The manual includes ten appendices. Appendix A, The Professional Point of View, contains material designed to orient the student to speech pathology as a profession. Appendix B, Building a Useful Professional Vocabulary, provides lists of professional terms designed to help the student develop a vocabulary that will enable him to "read the literature of other specialties and to discuss problems of mutual interest with many specialists." The practicality of including the lists as supplementary study assignments in a course in speech correction is questionable. Many of the terms cannot be defined briefly and concisely. Understanding of some of the terms might be difficult with the limited knowledge one could acquire through reading assignments as indicated. Presupposing that students have taken courses of training in the fields of which the lists are representative, the vocabulary should serve very well for review.

Appendix C contains a rating sheet for student clinicians to be used by the instructor. Appendices D, Observation of Non-fluencies of Normal Speakers, and E, Simulating Stuttering, are designed as aids to students to better understand the stutterer's problems. Appendix F, Evaluation of Hearing Acuity, and Appendix G, Making Observations of Adjustment and Reactions to Therapy, are questionable as supplementary material in a speech correction course upon the same basis expressed in the comments on Appendix B, above. Appendix H, The Preparation of Articulation Drill Material, Appendix I, Remedial Case Summaries, and Appendix J, Daily Logs, are well-designed helps for clinicians to use in therapy.

The methods and forms used in the manual were developed in the University of Iowa Speech Clinic, of which Wendell Johnson is director. Dr. Johnson is recognized as one of the outstanding authorities in speech pathology, and for many years has been a major contributor in research, experimentation, and literature on speech problems. His co-authors, Dr. Darley and Dr. Spriestersbach, both members of the Iowa Speech Clinic staff, are established experts in the field of speech correction.

The value of the handbook to other than students and speech correctionists receives mention in the foreword of the manual. The authors state that they had in mind the interests and requirements of related professional workers when the material was being prepared. The book would be valuable to physical therapists to acquaint them with speech problems, to designate areas of overlapping of the therapies of the physical therapist and the speech therapist, and to guide them as members of a team working with the handicapped. Especially would the manual be helpful to the physical therapist working in a center which does not employ a speech therapist where the child's whole improvement must be her responsibility.

Clinical Instruction and Its Integration in the Curriculum. *By Deborah MacLurg Jensen, R.N., M.A., Instructor in Nursing Education and Sociology, University of Missouri. In collaboration with Elizabeth O'Connell, R.N., M.S., Ruth E. Lindberg, R.N., M.S., Ed., and Dillie R. Gulmi, R.N., B.S.N.E. Cloth; price $5.75. Pp. 542, with illustrations and charts. C. V. Mosby Co., St. Louis, Mo., 1952.*

The authors are qualified in the field of nursing education on the basis of professional experience, graduate training, and teaching in various universities in this country. The wealth of detail included could be based only on a careful study of the varied problems inherent to this type of instruction. The aim of the writers has been "to try to lessen the gap between theory and practice in all nursing and to strengthen clinical instruction as an integral part of the curriculum in schools of nursing." The use of this book in classes in supervision and by instructors in nursing schools seems indicated. As was noted in the preface to the first edition, the information should be useful to head nurses and supervisors who must learn while "on the job."

The subject matter is divided into six units consisting of 23 chapters. In the first unit, material is included on recent changes in nursing education, the place of the school of nursing in the modern community, and suggested school programs. The second is given over to curriculum study; principles and trends are outlined, materials of instruction evaluated, and problems of administration reviewed in some detail. The third unit comprises basic principles of learning and methods of classroom and clinical teaching, while the fourth reviews measurement and guidance in the clinical field. The fifth unit covers faculty organization and preparation, and the sixth contains programs for clinical instruction in four major areas: nursing in medicine and surgery, pediatrics, obstetrics, and psychiatry.

As can be seen from the resumé, the authors include a tremendous amount of material. Those readers who may be searching for the answers to specific problems in clinical supervision will find it necessary to expend a considerable amount of time culling through basic principles of learning, methods of classroom teaching, and similar material for the information desired. In several instances when vital problems in clinical instruction are introduced, the reader is referred to a companion book, "Ward Supervision," for further information.

Instructors and clinical supervisors in schools of physical therapy should find many items of interest in this book. Four chapters (from units 1-5) that can be specifically recommended are those dealing with planning and administering clinical and other field experience, methods of teaching (clinical, including an excellent section on nursing care studies), and two chapters concerning types of evaluation procedures and how to use them. The outlines of clinical instruction (from unit 6) in four integrated programs in the nursing school are also of interest and offer ideas that could well be used for better integration of basic and clinical instruction in physical therapy programs.

Roosevelt and the Warm Springs Story. *By Turnley Walker. Cloth*

binding; price $3.50. Pp. 309. A. A. Wyn, Inc., New York, 1953.

This is the story of Franklin D. Roosevelt from 1924 shortly after he contracted poliomyelitis until his death, and especially of the part which Georgia Warm Springs played in his rehabilitation. It is a warm and intimate story, not of the politician, but of the man who became president in spite of a terrific physical handicap and yet had the time and interest to inspire and assist others.

The author, himself handicapped by poliomyelitis in 1949 and treated at Warm Springs, fully appreciates all that is entailed in the return of a handicapped person to normal living. He mentions the important milestones in the development of the treatment center and recalls many of the patients by name. Physical therapists will find familiar and respected friends in the parade through the years. In preparation for this book, Mr. Walker contacted scores of people to validate his story and collect the anecdotes which make this such fascinating reading.

As an interesting corollary, we see the growth from a country inn with a constantly flowing spring of warm water to the present Georgia Warm Springs Foundation, and eventually to the National Foundation for Infantile Paralysis. We realize how much is owed to the wise guidance of Basil O'Connor, Mr. Roosevelt's law partner, now president of the Foundation, and to the generosity and selfless effort of many others.

The end plates of the book are covered with sketches of well known places at Warm Springs and bring poignant memories to anyone who has ever spent any time there. Mrs. Eleanor Roosevelt in the foreword says she thinks that people will enjoy the Warm Springs Story and her husband's part in it.

This book is recommended reading for anyone who cares for handicapped persons, and especially polio patients. It is an inspiration to both the person and his family in the long fight back to a useful and satisfactory life.

The reviews here published have been prepared by competent authorities and do not represent the opinions of the American Physical Therapy Association.

Meet Our New Contributors

Virginia M. Badger, Physical Therapist, Orthopaedic Hospital, Los Angeles, received her physical therapy certificate from Childrens Hospital School of Physical Therapy, Los Angeles, her B.A. degree from Occidental College, and is working on her master's degree at the University of Southern California.

Miss Badger has held her present position as physical therapist at Los Angeles Orthopaedic Hospital for over four years. She is a member of the American Physical Therapy Association, Southern California Chapter, and of the American Registry of Physical Therapists.

John Gabala, Staff Physical Therapist, St. Anthony's Hospital, St. Louis, attended East Stroudsburg State Teachers College for two years, but received his B.S. degree in physical therapy at St. Louis University.

In September 1953, Mr. Gabala will begin medical studies at St. Louis University School of Medicine. He is a member of the American Physical Therapy Association, and appears in "Who's Who Among Students in American Colleges and Universities."

Carmela Gonnella (see July 1952 *Physical Therapy Review* for biographical sketch).

Georgianna Harmon, Instructor, Division of Physical Therapy, Stanford University, matriculated at the University of Texas, graduating with a B.S. degree, and received her preparation in physical therapy at Walter Reed General Hospital. For the next three years she served as physical therapist in the Army Medical Corps and upon completion of her tour of duty she became affiliated with the Poliomyelitis Teaching Program at the University of Colorado Medical Center, Denver. Work for her master's degree was completed at Stanford University in 1952.

Miriam Jacobs, Instructor, D. T. Watson School of Physiatrics, attended Seton Hill College in Greensburg, Pennsylvania, where she was graduated with a B.A. degree. Following graduation, Miss Jacobs enrolled at the D. T. Watson School of Physiatrics for her physical therapy preparation.

Miss Jacobs has been on the staff of the D. T. Watson Home for Crippled Children, Leetsdale, Pennsylvania, and a member of the Epidemic Aid Team for several years. She is a member of the American Physical Therapy Association and the American Registry of Physical Therapists.

Margaret A. Losty, Hospital Nursing Consultant, New York City Department of Health, attended Fordham University, where she was enrolled in the School of Social Service, and Columbia University, where she received her B.S. degree.

Among the positions held by Miss Losty are Assistant Director of Nursing at French Hospital, New York, Hospital Nursing Consultant, New York City Department of Health, Maternity, and Newborn Service, and Director Nursing Service Consultant, National Foundation for Infantile Paralysis.

Miss Losty is a member of the American Nurses Association, National League for Nursing, and American Public Health Association.

Lucy V. McDaniel, Associate, Curriculum in Physical Therapy, University of California (School of Medicine), San Francisco, attended University of California, Los Angeles, receiving her B.S. degree in 1942, and the University of Missouri for her M. of E. in 1943. Miss McDaniel's physical therapy training was received at the U. S. Army School, Brooke General Hospital.

Miss McDaniel served as physical therapist in Army Hospitals in California and at the 361st Station Hospital in Tokyo. She is a member of the Northern Chapter of

the American Physical Therapy Association, and of the American Registry of Physical Therapists.

Herbert Rich, Senior Statistician, New York City Department of Health, received his B.A. degree from Brooklyn College and at present is doing graduate work at Columbia University.

Mr. Rich is a member of the American Statistical Association and the American Public Health Association.

Zandra S. Ross, Staff Physical Therapist, Children's Hospital, San Francisco, was educated at the Royal Gymnastic Central Institute, Stockholm, Sweden. She later attended the School of Physical Therapy at the Hospital for Special Surgery, in New York, and has held the positions of physical therapist at the Princeton Hospital, the Princeton Medical Group, and has been affiliated with the Kabat-Kaiser Institute, Vallejo, California, and the Respiratory Center at University of California, Los Angeles.

Mrs. Ross is a member of the American Physical Therapy Association.

Robert Siffert, M.D., Senior Orthopedic Consultant, New York City Department of Health, received his medical training at the New York University Medical School, and prior to his present office, was Adjunct Orthopedic Surgeon, Mount Sinai Hospital.

Dr. Siffert is Diplomate, American Board Orthopedic Surgery; Fellow, American Academy of Orthopedic Surgeons; Fellow, American College of Surgeons.

Esther Snype, Physical Therapist, Iowa Methodist Hospital, Des Moines, attended Talladega College, Talladega, Alabama, and was graduated in 1946 with an A.B. degree in natural sciences. The following year she entered Graduate Hospital, University of Pennsylvania, and completed requirements in physical therapy in September 1948.

Miss Snype has been a member of the physical therapy staff at the Los Angeles County General Hospital; Rancho Los Amigos, Hondo, California; and St. Cloud Hospital, St. Cloud, Minnesota. Miss Snype is a member of the American Physical Therapy Association.

Mary Jane Torp, Captain, WMSC, Staff Physical Therapist, Tokyo Army Hospital, was graduated in 1943 from Northern State Teachers College (South Dakota) with a B.S. degree in education, and has taken additional studies at Trinity University, Texas, and Sophia University, Tokyo.

Captain Torp is army trained, having been awarded her physical therapy certificate from O'Reilly General Hospital in 1946. Since that time she has held positions in the physical therapy departments of the Army and Navy Hospital General Hospital in Arkansas, Kabat-Kaiser Institute, Brooke Army Hospital, and at present the Tokyo Army Hospital, Japan.

Captain Torp is a member of the American Physical Therapy Association and the American Registry of Physical Therapists.

Helen M. Wallace, M.D., Director, Bureau for Handicapped Children, New York City Department of Health, is a graduate of Wellesley College, receiving her A.B. degree in 1933, Columbia University College of Physicians and Surgeons, where she earned her medical degree in 1937, and Harvard School of Public Health, where she received the M.P.H. (cum Laude) in 1943.

Among the positions Dr. Wallace has held are Chief Hygiene Physician, Connecticut State Department of Health; Director, Emergency Maternity and Infant Care Program, District Health Officer, Chief Maternity and Newborn Division—all in the New York City Department of Health; Associate Professor of Pediatrics, New York Medical College; Associate Attending Pediatrician, Flower-Fifth Avenue Hospitals.

Dr. Wallace is Fellow of the American Medical Association, the American Public Health Association, American Academy of Pediatrics, and the New York Academy of Medicine.

Classified WANT-ADS

QUALIFIED PHYSICAL THERAPIST (male or female). One now and another in the fall. Either experienced or inexperienced therapist. Rapidly growing Rehabilitation Center, good opportunity for promotion. Salary schedule designed to attract the best. Five-day week, Monday through Friday, 8:30 a.m. to 4:30 p.m. Holidays off, paid vacation and sick leave. Social Security, Workmen's Compensation, Blue Cross and Blue Shield. Contact Roy E. Patton, Executive Director, Crossroads Rehabilitation Center, 3001 North New Jersey Street, Indianapolis 5, Indiana.

PHYSICAL THERAPIST, registered, wanted in 113-bed hospital located near Chicago, Ill. Active department. Excellent salary, vacation and sick leave benefits. Apply Personnel Director, Highland Park Hospital, Highland Park, Illinois.

WANTED: REGISTERED physical therapists (5) for modern cerebral palsy outpatient treatment center: 35-hour week. Four weeks' vacation with pay. Good starting salary with annual increases. Uniforms and laundering supplied. Women preferred. Write C. H. Wiemer, Executive Director, United Cerebral Palsy Center, Roosevelt, Long Island, New York.

WANTED: TWO QUALIFIED PHYSICAL THERAPISTS to work in established department in new 700-bed hospital. Work is supervised by specialist in Physical Medicine and Rehabilitation. Good starting salary, vacation, sick leave and retirement benefits. Write Herman J. Bearzy, M.D., Director of Physical Medicine and Rehabilitation, Miami Valley Hospital, Dayton 9, Ohio.

WANTED: PHYSICAL THERAPISTS—Children's convalescent hospital, affiliated with Western Reserve University and University Hospitals; 40-hour week; 6 holidays; annual vacation and sick leave with pay. Maintenance optional at low cost. Write for illustrated booklet. Assistant Director, Rainbow Hospital, Cleveland 21, Ohio.

WANTED: QUALIFIED PHYSICAL THERAPISTS interested in service in the public health field. Opportunity as a junior staff member to work under the guidance of a qualified, experienced senior physical therapist. University study available through local facilities. Good personnel policies. Good salary dependent on experience. Immediate placement. Write to Ruth E. TeLinde, Executive Director, Visiting Nurse Association, 1234 North Prospect Avenue, Milwaukee, Wisconsin.

WANTED: PHYSICAL THERAPIST, female, for large general hospital located in Medical Center of Chicago. Five-day, 40-hr. week, Blue Cross, group insurance and other benefits. For further details write Miss Jean Grothkob, Personnel Dir. Presbyterian Hosp., 1753 W. Congress St., Chicago, Ill.

WANTED: QUALIFIED PHYSICAL THERAPIST for Cerebral Palsy Clinic in Charleston, W. Va. Contact Mrs. Charles C. Wise, President, Kanawha County Society for Crippled Children and Adults, Inc., 418 Professional Building, Charleston 1, W. Va.

WANTED: STAFF PHYSICAL THERAPIST for rapidly expanding dept. including all phases of poliomyelitis. Working conditions excellent. Salary open. Contact L. G. Trousdale, Administrator, St. Luke's Hospital, Summit Blvd. and A St., Spokane 11, Washington.

WANTED: PHYSICAL THERAPIST for Berkshire School for Crippled Children, Pittsfield, Mass. Five-day, 40-hour week, all holidays, month of August off, three weeks at Christmas. For information and further details, write Catharine S. Dover, Supt.

WANTED: TWO QUALIFIED PHYSICAL THERAPISTS for Physical Medicine Rehabilitation and Polio Center, Baton Rouge General Hospital, Baton Rouge, La., on permanent basis or temporary assignment six months during polio emergency. Excellent salary scale according to experience. Wire or phone collect to ROBERT B. WALLACE, M.D.

PHYSICAL THERAPIST: Woman assistant in established public school program. Salary schedule, retirement plan, good working conditions. Ten or twelve months employment as you prefer. Apply to: Assistant Superintendent, Lansing Public Schools, 419 N. Capitol Avenue, Lansing, Michigan.

WANTED: 2 STAFF OPENINGS for Chief Physical Therapist and Assistant Therapist. Experience in polio cases desirable. Excellent opportunity in 200-bed hospital. Good starting salaries. Located between Denver and Yellowstone Park. Apply Personnel Director, Memorial Hospital, Casper, Wyoming.

WANTED: Physical therapist. Excellent salary and good working conditions. Vacation period. Contact Robert Landesman, Director, Cerebral Palsy Clinic, Liberty-Loomis Hospital, Liberty, N. Y.

WANTED: ADDITIONAL qualified physical therapist, female, for work with three orthopedic surgeons in office, part-time in hospital. Good variety of cases. Excellent salary, month's vacation. For further information, write Dr. R. L. Anderson, 1208 Kanawha Boulevard, Charleston, W. Va.

PHYSICAL THERAPIST, female, full-time beginning September 7, 1953, midwestern college student health service, 5,000 students. Forty-hr. week. Paid vacation. Good equipment. Pleasant working conditions. Address replies to Box 98, care of the Physical Therapy Review, 1790 Broadway, New York 19, New York.

WANTED IMMEDIATELY. Qualified female physical therapist for 350-bed industrial hospital. Forty-hour week and good working conditions. Write: Dr. Arthur Rodriquez, Physiatrist, Illinois Central Hospital, 5800 Stony Island Ave., Chicago 37, Ill.

WANTED: Physical therapist for 250-bed general hospital. Good salary and working conditions. Newest and latest equipment. Write M. R. Speer, Superintendent, Columbia Hospital, Wilkinsburg, Pa.

TWO PHYSICAL THERAPISTS for Visiting Nurse Association staff to give general physical therapy service in homes, physical therapy center, or combination of both. Good starting salary, regular increases. Five-day, 40-hour week, 4-weeks' vacation, sick leave, social security and retirement plan. Write: Leeta Holdrege, Director, 1201 So. 42 Str., Omaha, Nebr.

PHYSICAL THERAPIST FOR C. P. training center. Must have specialized training or experience in this field. Will have to organize and set up P. T. program in new center to be opened in September. Salary open, depending on qualifications. Apply at once to Peninsula Cerebral Palsy Association, P.O. Box 371, Hampton, Virginia.

WANTED: Physical Therapist for work in general hospital of 500 beds. Department has personnel of 5, State Retirement, salary open. Binghamton City Hospital, Binghamton, N. Y.

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